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THE GEOGRAPHICAL JOURNAL

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The Geographical Journal

Vol. LXVI No. 2 August 1925

THE SIERRA NEVADA OF SANTA MARTA, COLOMBIA

A. F. R. Wollaston

Read at the Meeting of the Society, 9 March 1925.

THE Northern Province of the Republic of Colombia, the Magdalena Province, forms roughly a wedge-shaped territory, bounded on the west by the Magdalena river, on the east by a last spur of the eastern cordillera of the Andes, and having its base on the Caribbean Sea. The most conspicuous natural feature of the province is a lofty range of mountains, culminating in snow-capped peaks of between 17,000 and 18,000 feet, the Sierra Nevada of Santa Marta. Passengers in the infrequent steamers that ply along this coast are apt to persuade themselves that they have seen the Andes. The range is not a part of the great Andean system either geographically or geologically. It is separated from the Andes by the broad plain of the Magdalena river on the south and west, and by a long open valley, the Rancheria, on the south and east. "Geologically, in general structure and in the character of its rock formations, the Sierra Nevada resembles most other sections of old land found in the Caribbean region (North Venezuela, the West Indies, and Central America), and there is reason to believe that at one time it constituted a part of the Antillean land mass, of which the islands of Curaçao, Aruba, etc., are also remnants. At any rate, it is a very old section of the Earth's crust, having been elevated above sea-level since the beginning of the Palæozoic Period, and not thereafter submerged. The Andean uplift in general took place in the second half of the Tertiary." * The main axis of the Sierra Nevada is east and west, whereas that of the Andes is north and south. Other observers have remarked that the Sierra Nevada is free from the earthquakes which are so frequent in the Andes. This is not quite accurate; we experienced one shock of considerable violence when in the middle of the range.

In or about the year 1537, when Charles V. wanted to discover El Dorado, a party of about two hundred Germans and Spaniards, led by a German called Alfinger, penetrated to the junction of the Rio

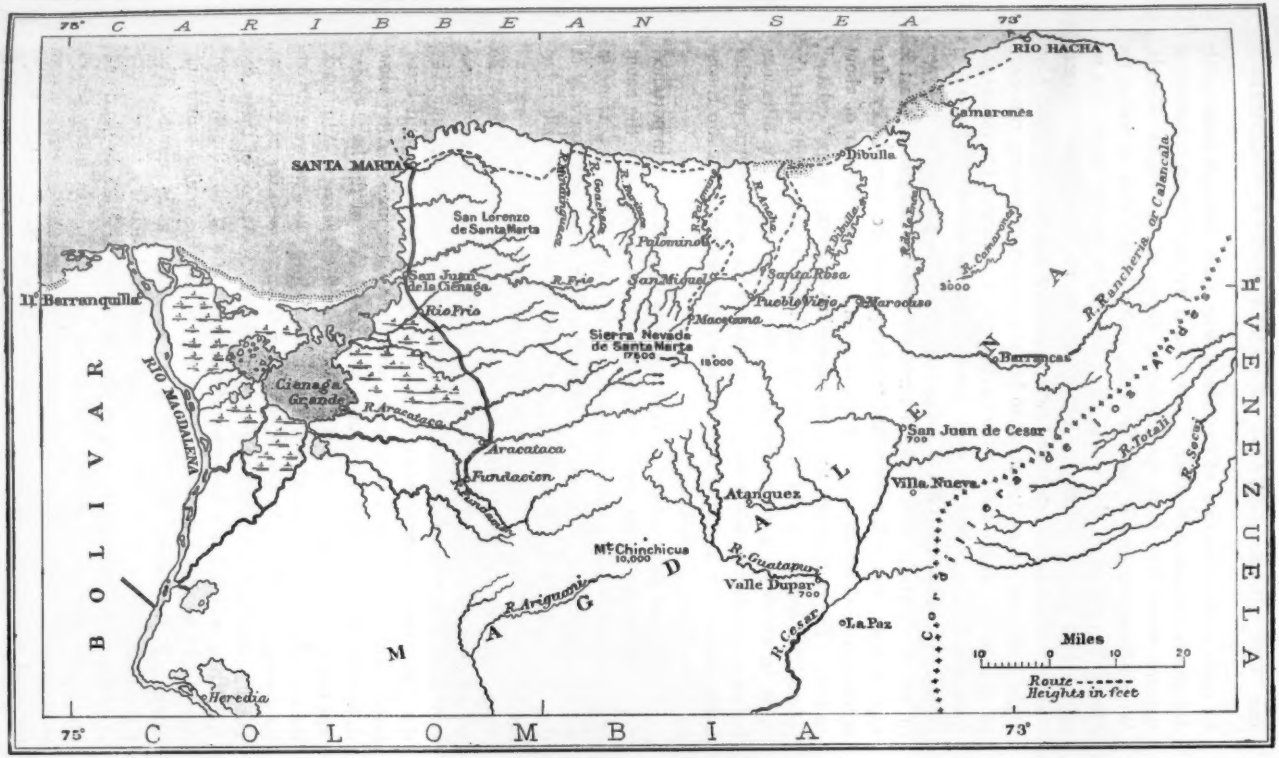
* Todd and Carriker.

Cesar with the Magdalena, where they found a people enormously rich in gold. A number of Indians were loaded with gold and sent off to the coast, while the rest stayed where they were. After a year's delay in expecting relief they started back toward the coast, and crossed a region so lofty and so cold that many of the Indians and even the Spaniards were frozen to death. Afterwards they descended to a hot tropical valley, where Alfinger died. It seems that they must have marched right across the Sierra Nevada from south to north, one of the most remarkable of the many astonishing exploits of the conquistadores. In the following centuries Spanish priests pushed their ways to the fringes of the mountains, but little, if anything, was known of the topography of the region until 1878, when Mr. F. A. A. Simons, who spent three years in the province, crossed a high pass in the mountains and made almost the only map of the district that exists.

A number of naturalists, notably Mr. W. J. Brown, Mr. M. T. Dawe (Director of Agriculture to the Colombian Government), and recently Mr. J. A. Mason of the American Museum, N.Y., and the ornithologists M. A. Carriker and W. Todd of Pittsburgh, have visited the range in quest of specimens for museums, but a great deal of the range is still unknown to Europeans. A distinguished Fellow of this Society suggested to me that I should go and look at the range with a view to a possible further venture, and in the autumn of 1923 I took an opportunity that unexpectedly occurred of visiting Colombia with my wife. We made the voyage from Hull in one of the comfortable banana boats of Messrs. Elder & Fyffe. The only incident of the nineteen-days' voyage, during which we never sighted a ship and only a very few birds, was on December 12, when in lat. 13° N., at 2 p.m. in brilliant sunshine I had a clear view with the naked eye of the planet Venus.

The harbour of Santa Marta is a beautiful circular bay, well sheltered from all winds. It is used by a few small sailing craft and by the fleet of steamers controlled by a gigantic American corporation, the United Fruit Company; two or three steamers laden entirely with bananas leave for the U.S. and Great Britain every week. The town of Santa Marta is one of the oldest in South America, having been founded in 1525, and there its claim to distinction ceases. Nearly all the old Spanish buildings have disappeared, and the modern houses are either ramshackle hovels or pretentious villas. The streets are a series of pits filled with sand or dust. The American suburb, where we were hospitably entertained, is thoroughly modern and suited to the tropical climate.

Outside the town is the old-fashioned country house where Simon Bolivar, the founder of so many republics, died; there is an interesting collection of relics. A few miles to the east of Santa Marta is the San Lorenzo range of mountains rising to about 7000 feet and connected by spurs to the east again with the Sierra Nevada, which is not visible from the town. A light railway runs south from Santa Marta for about



The Sierra Nevada of Santa Marta.

60 miles in the direction of the Madgalena river, through land mostly devoted to banana cultivation. The land is irrigated from a number of streams which flow from the southern slopes of the Sierra Nevada. We made excursions in that direction, partly with a view to seeing the Sierra Nevada from the south side, and partly in the hope that we might find people willing to accompany us up one of the southern valleys. The amount of snow seen from that aspect was disappointingly small, and there appeared to be no prospect of getting transport, so we decided to go in from the north and to approach the mountains from Rio Hacha, where we were assured that we should find plenty of mules. We refused an offer of a dug-out canoe; the prospect of a voyage of ten or fourteen days along a hundred miles of dangerous coast in such a craft was not sufficiently tempting, and we were lucky after several days' delay in finding a passage in a small schooner of about 30 tons. The captain and the mate allowed us to occupy their "cabins"—two little hutches 5 feet long by 2½ high and 2 wide, right over the stern, in which we were imprisoned by the heavy seas. The afternoon before we landed we saw a magnificent view of the whole Sierra 30 miles to the south of us, and after three unhappy days we landed at Rio Hacha on the morning of Christmas Day.

Rio Hacha was founded in 1548 and was once of some importance, but it has decayed even more than Santa Marta, and is now the haunt of pearl-poachers and rum-smugglers. It is hoped that a new trade in a native fibre may bring back prosperity. The town was formerly at the mouth of the Rio Rancheria, or Calancala, as it is here called, but the river has now altered its course about 3 miles to the east, whence all water must be carried in barrels to the town. The river forms the boundary of the territory occupied by the Goajiro Indians, a very vigorous and warlike people, who are left in a more or less independent state by the Colombian Government. They are very fine horsemen and breed horses and mules, which they trade with the Colombians. After some days spent in bargaining for mules—our impression of the local trader was not very favourable—we left Rio Hacha with no regrets. Our track led for several miles through a thorny cactus scrub until we were driven by swamps to take to the beach, which we followed west for 25 miles to Dibulla, crossing a number of rivers on the way. At one of these, the Rio Enea, which has a bad reputation for the size of its alligators, we were lucky to find a canoe in which we crossed, the mules swimming astern. Riding along the beach is not so simple as it sounds. The rise and fall of the tide is a few feet only, and the beach is a narrow strip of soft sand with the heavy surf of the Caribbean Sea on one hand and mangrove swamps or muddy lagoons on the other. In many places stranded logs or long projecting mangrove branches make a fence across the sand and compel the reluctant mules to take to the Caribbean Sea.

Dibulla is a large village of about two hundred mud huts at the mouth

FOOTHILLS FROM DIBULLA

NORTHERN SLOPES OF SIERRA NEVADA, ABOUT 5000 FEET

RIDGE DIVIDING MACOTAMA AND PALOMINO VALLEYS

PEAK ABOVE MACOTAMA FROM THE NORTH-EAST

HIGHEST PEAK ABOVE PALOMINO FROM THE NORTH

of the Dibulla river. There is a small amount of sugar and coconut cultivation, and a good number of turtles are caught in the sea and lagoons. We had been warned at Santa Marta that the people of Dibulla were thieves and pirates, but we found them not uncivil. Their worst failing, as of all the people we met, was their masterly indolence. Nothing will make them undertake any piece of work until to-morrow, and to-morrow is often many days in coming. The transport animals we used from here onwards were mountain bulls, for the most part very docile animals, and as clever as yaks in climbing up steep and slippery places. The usual load is about 120 lbs. When at last we set out from Dibulla, we followed the coast west for a few miles and then turned sharp south toward the mountains through a tangled country of grass and thorny bush interrupted with swamps and lagoons. Gigantic horse-flies and myriads of sand-flies make this region almost intolerable. It was a relief to reach the foothills and to find ourselves in the coolness of forest, or rather woodland: the trees hereabouts are of no great size. Animal-life is remarkable by reason of its scarcity. Sometimes parrots and macaws are seen overhead, and more rarely a humming bird may be seen hovering about a flowering tree beside a stream. Butterflies, mostly of the genus Morpho, are very few. Occasionally our track followed an old Indian road about 4 feet wide made of large blocks of granite roughly squared. We met some of these paved ways in other districts; they date from centuries before the Conquest, but little is known of their origin.

Two long marches from the coast brought us to the small village of Pueblo Viejo. This was an Indian settlement until a few years ago, when the inhabitants were driven out by the (so-called) *civilisados*, a people of mixed origin from the coast, who earn a lazy living by barter with the simple Indians from the higher valleys. Here we were accommodated in a small mud house with a grass roof, where we had a constant throng all day of men, women, and children staring at our various occupations. Many of them are of almost pure negro blood, but in manners they compare very unfavourably with most of the native races of Africa. Even children of quite tender years acquire the habit of clearing their throats noisily and spitting broadcast in your house. We were visited at Pueblo Viejo by a number of Indians, who were greatly interested in my wife, as they had never before seen a white woman. Partly by reason of her long hair, they were fully persuaded that we were father and son.

The slopes above Pueblo Viejo are almost entirely denuded of trees by long cutting for firewood, and are covered with good grass, which harbours innumerable ticks. You cannot walk 100 yards without attracting a swarm of these nasty little pests; they are almost invisible, and cause an intense irritation of the skin. We used to spend about an hour de-ticking before we could go to bed. Temporary relief may be found

by bathing in the brilliantly clear torrent, which is still very cold at this low altitude of 3000 feet. The stream at Pueblo Viejo is a branch of the Rio Ancha, which, with various names in the different parts of its course, takes its origin from the most eastern of the group of snow peaks.

From Pueblo Viejo we proceeded west, crossed a steep dividing ridge of about 6000 feet, and descending to the Rio Ancha followed it up for several miles until we came to the purely Indian village of San Miguel. Here we stayed for several days and had an opportunity of becoming acquainted with the native inhabitants. They belong to the Indian tribe called Arhuaco, who are confined to this range of mountains, and they call themselves Cuguí.* They are small people of poor physique: I do not think that any we saw measured more than 5 feet 5 inches. The hair is worn long by both men and women; very few grow any hair on the face. The colour of the skin is a pale mahogany, obscured by dirt. Every man carries two or three *muchilas* or bags, slung over the shoulders and containing food and odds and ends. Some are roughly netted of fibre and some very well woven of cotton in pretty-coloured designs, white, yellow, and purple. They grow a little cotton, but import most of it, which they spin and weave into a very good stout fabric of which their clothes are made: the spinning is done by the women, the weaving by the men. The men wear a small peaked helmet-shaped cap and a long upper garment like an overgrown shirt slit at the sides and a pair of short drawers. The over-garment is sometimes elaborately ornamented at the shoulders. The women go mostly dressed in rags, relieved by several strings of beads round their necks; some have beautiful carnelians and other pebbles rounded and polished, and bits of red coral.

They inhabit villages of as many as one hundred huts. The entrance to the village is guarded by a sort of lych-gate with heavy wooden doors. The houses are made of wattle and daub, with a thatch of grass, and are mostly round, laid out in straight lines. We were informed that when they build a new house they make the roof first, lay it on the ground, and mark out from it the size of the walls. A few of the houses, those in which they weave their cotton cloth and the religious houses, are made of plaited reeds. The young bachelors live in common houses together. After marriage a man lives in a house by himself and his wife alone in a house near by: they eat together outside the door of the wife's house. Families are small, seldom more than two. When we arrived at San Miguel the village of about sixty houses was almost deserted. Nearly all the people were away at their gardens, which may be many miles away in the mountains. There they have another house and cultivate small patches of beans, sweet potatoes, plantains, and a root like a white carrot; they eat also the root of the wild canna, which is excellent. Their most profitable crop, grown up to 6000 feet, is sugar-cane, which

* See Dr. K. Th. Preuss' contributions to *Anthropos* (Vienna), since 1919.

provides their only means of trading with the world below. The canes are crushed in a very primitive wooden mill turned by an ox. The juice is collected in a wide vat and simmered slowly over a fire until it solidifies into the sugar cake known as *panela*. Whilst the simmering is proceeding, the scum is scooped from the surface and collected in gourds, in which it is allowed to ferment for some days. When this is matured, they drink it and become most riotously intoxicated. Another of their amusements is playing on reed instruments of two different pitches, called male and female; the duets they play are interesting, but to our ears discordant.

The principal occupation of the men appears to be the taking of coca from a small gourd, held usually in the left hand; it contains the mixture of powdered coca leaves and lime. Into this they dip a long thin stick, which brings out a little of the powder; they suck this off and then dry the stick by rubbing it round the open end of the gourd, until in the course of months the end of the gourd has a lump of dried stuff on it as big as the hollow bulb of the gourd itself. The men only take the coca, and many of them have a drugged sleepy look. They take immense pains in the cultivation of the coca bushes, building up terraces for them on the hillsides so that they can be irrigated in the dry season.

A few plants of tobacco are grown about the houses; this is not smoked, but is used in greeting. When two men meet, each takes out his tobacco-box (two little gourds jammed together) and hands it to the other, who opens it and dips his finger into it and touches his lips with the finger; this is repeated rapidly several times. Then the boxes are handed back and each man gives the other a small quantity of green coca leaves, which he puts into his mouth and chews.

Going south from San Miguel up the valley, which is here called Macotama, we noticed many signs of a former much larger population. Near the village was a wonderful staircase of huge squared granite blocks leading straight up a hill of about 200 feet; some of these blocks must weigh fully half a ton. In many places were wide artificial terraces for old cultivation, and the remains of large irrigation channels or aqueducts ingeniously cut along the hillsides. It was obvious, too, from the innumerable cattle tracks along the mountain slopes, that the herds must have been very large in former times: the number they keep now is very small, and we had difficulty in hiring four to carry our gear above San Miguel.

As we went higher, signs became more frequent of the religion, if such a word may be used, which these people practise. At intervals we noticed houses different from the rest, larger, made of reeds, and with a curious horizontal top-knot, often adorned with broken pottery, at the peak of the roof. In these houses dwell what must be called priests or holy men, who live upon the fears and superstitions of the laity. They make what laws they will, and are, I think, more feared than loved.

It was impossible through our interpreter, whose knowledge of their tongue was meagre, to find out the exact nature of their religion. But the general motif of it appeared to be fear ; fear of sickness, fear of death, and above all fear of demons. All their actions are designed to ward off some calamity. We saw no signs of any outward worship, but we often heard sounds of high-pitched chanting and the beating of drums in these houses, and we were told that they were preparing for a great festival and religious dance. The holy men are supposed to hoard golden treasures of great antiquity, but they would never be persuaded to show them to us, if indeed they existed. The only curious objects we saw in these houses were very crude feather masks, which are used in their dances. Outside some of these places were to be seen what they called divining chairs : a flat stone laid on the ground with a long sloping stone firmly fixed into the ground behind it and forming a back. The holy men will, when necessary, sit on one of these chairs, fall into a trance, and tell the inquirer his future or his duty or whatever the question may be. A more sinister object that we saw in one very holy place was a large granite boulder on a much-trampled spot ; on it was lying a most murderous wooden club, and about it were splashes of dried blood. Our attendant Indians passed the place as quickly as they could, and we were unable to find out what orgies were enacted there.

Even at that dry season, the beginning of the year, clouds filled the valley for several hours during the day at San Miguel, which is only 6000 feet, and the nights were as cool as in the ordinary English summer. As we went up, the valley narrowed and our camps became colder and more sunless, but it was not until we made a camp near 12,000 feet that we first saw frost in the morning. That is far above the highest dwelling, but semi-wild cattle roam up to 13,000 and 14,000 feet. It is a singularly lifeless region up there, and indeed the whole country above 3000 feet is very destitute of living things. You may go for hours without seeing a bird, and flowering plants are very few. It is more like a lunar than an earthly landscape. Above 12,000 feet the valley widens out into what is called *paramo*, that is open rocky country with very sparse vegetation, steep in many places, but seldom precipitous. Evidences of former glaciation were conspicuous down to 11,000 feet. On this *paramo* of Macotama we came to a small deep lake (about 300 yards by 150 yards) at 12,700 feet, and connected with it by a small rivulet another lake or tarn at 13,500 feet. Above this was no water to be found.

It was about here, so far as I can make out, that Mr. Simons crossed the range in 1878 ; there is an obvious gap on the watershed at about 14,000 feet. Following the valley, which makes a rather abrupt turn to the south-west above the lower lake, we found ourselves on a low ridge dividing us from the head of another valley, the Palomino, and following up this ridge to the south at 16,000 feet, we were on the main watershed of the range. The rock hereabouts is a fine pink granite,

from which most of the snow had recently melted. Half a mile to the south-west was a steep snow-capped peak of (approximately) 17,500 feet, with a small glacier clinging to its northern slopes down to about 15,500 feet. This peak is the most easterly of the range bearing ice and snow, and from the point we reached it completely masked the higher peaks to the west of it. Dense clouds were blowing up from the south, in which direction no view was possible, and as the peak near to us was soon enveloped, we made no attempt to climb it. A succession of cloudy days and the miserable plight of our followers sent us down the valley again to Pueblo Viejo.

From there we made our way west, crossing innumerable valleys, descending sometimes as low as 2000 feet and climbing again to 9000 feet, and after four days' travelling we found ourselves in the valley of the Rio Palomino, whose waters come from the highest group of peaks. This valley is wider and sunnier than those to the east, the land is more fertile, and the people look better fed and more contented than those we had seen before. The village of Palomino is within sight of some of the snow tops, and by climbing 2000 or 3000 feet above it you may get a wonderful view of the central part of the range. And this was as far as we were able to go. The main Palomino valley, branching south-east a mile or two above the village, appears to afford a direct approach to the highest peaks, and it was easy with glasses at a distance of about 8 miles to plan an apparently practicable route to several of the summits. But the people, for some mysterious reason, refused flatly to accompany us up the valley. They were equally obdurate in refusing to take us by a track, which they sometimes use themselves, across the mountains west of the snow peaks. There remained only the way back to the coast, and we had difficulty in persuading them to hire us oxen to carry us thither; they said they would all die if they went there. It was small wonder that they were reluctant to go; it was two long days of constant climbing and descending steep ridges covered with very dense jungle, infested with the most vicious mosquitoes, sandflies, and horseflies we had yet met. The inhabitants of a small and dirty village at the mouth of the Palomino river are negroes, descendants of escaped slaves, and not too friendly. From here we followed the coast west for about 40 miles, crossing numerous rivers, the most considerable being the Buritaca, Goachaca, and Mindinguaca. West of the last-named river we left the coast, traversing the only forest of really big trees we saw in the region, then through open savanna, across a low spur of the San Lorenzo range, and so down to Santa Marta.

As I stated at the beginning of this paper, the journey was made rather as a preliminary reconnaissance, to inquire into the methods of transport and the ways of approaching the heart of the range. To go in from the north is unquestionably the best way for any one who can choose his own time. As it happened, we chose the only season of the year

when it is possible to traverse the country north of the mountain. From mid-December until the end of March the rainfall is small, the lowlands dry up, and the rivers become fordable, although even at their driest we found some of them formidable enough. At all other seasons that level country is a most unwholesome swamp and the rivers are only passable by canoes. Another good way is to go up the valley of the Rio Frio in the south-west; and a longer way is further south by Valle Dupar.

Apart from the physical difficulties of the country the most serious problem is that of transport. The people of the coast are unwilling to venture further than the coast, and in any case they are soft and of poor physique and would hardly tolerate the changes of climate. The native Indians cannot be relied on to work for a stranger for more than a day or two at a time. A knowledge of Spanish is necessary, and it is essential to find some man among the *civilisados* who can communicate with the Arhuacs in their own language. The best chance of success would, I think, lie with a small party accompanied by the smallest necessary number of men accustomed to coolie work, recruited from the more temperate of the West Indian islands. There is a valuable piece of mountain exploration here to be done, and it could be completed in a six months' absence from England.

Before the paper the CHAIRMAN (Lord EDWARD GLEICHEN) said: We are to hear to-night a lecture by Mr. Wollaston, who hardly needs introduction to this Society. As you know, Mr. Wollaston has travelled in Central Africa, in New Guinea, and other out-of-the-way parts. Last, but not least, he was the Medical Officer of the first expedition to Mount Everest. He is now to tell us of a journey which he took with Mrs. Wollaston to the Santa Marta Range in Colombia. This Santa Marta Range, in the extreme north-east of Colombia, is very little known. It is about the same size as the whole range of the Ruwenzori Mountains, and a thousand feet or so higher. There is snow on the Santa Marta Range during a large part of the year, although it is not so very far from the Equator. The landscape is perhaps not as interesting as the range in Africa, where there is a much heavier rainfall, and vegetation is not so prolific. Only one Englishman, I think, has been in the country through which Mr. Wollaston has travelled. I must tell you that the rest of Colombia is very different from the Sierra Nevada de Santa Marta. Elsewhere you will find richer lands and much more vegetation. At this moment I believe that most of the platinum of the world comes from Colombia, and there are also emeralds and gold and many other resources to be found.

Mr. Wollaston then read the paper printed above, and a discussion followed.

The CHAIRMAN: We are honoured this evening by the presence of the Colombian Minister, Señor Don Luis Cuervo Marquez, and I am in hopes that we shall be able to persuade him to address a few words to us.

H.E. the COLOMBIAN MINISTER: I have heard with deep interest the very important lecture of Mr. Wollaston, whom I congratulate heartily on his trip to the Sierra Nevada de Santa Marta. And I beg your kindly excuses for my English in which I dare to address you, because if I speak in

Spanish you cannot understand me. The Sierra Nevada lies in the vertex of the angle formed by the Magdalena river and the Atlantic Ocean, close to the sea, and is a system of mountains independent of the gigantic Andes which run all across South America. Compared with the Andes, the Sierra Nevada is a very small hill. Owing to the geological conformation, to the winds, to the sunshine, the humidity of the atmosphere, etc., some sides of the Sierra are barren, rough, without vegetation, while others are fertile, and covered with forest and plantations of different kinds: cacao and banana at the foot, sugar-cane and coffee after, and above wheat, barley, and trees and grasses of the temperate zone. Mr. Wollaston was on the inclement side. The Sierra Nevada described by him is a small portion of wild land that cannot give an accurate idea of Colombia, which is not the object of the lecture. But you will kindly allow me to say a few words about Colombia.

We have seven millions inhabitants; 55,000 square miles; coasts on the Atlantic and the Pacific Oceans; very rich mines of gold, silver, platinum, emeralds, iron, etc.; magnificent plains with grasses for breeding cattle and horses; big rivers and enormous forests; and, which is the most important, a people kind and honest ruled by a settled Government, obedient to the Constitution and Laws of the country. We have had no revolution since thirty years ago, and our finance has the rate of exchange at par with the dollar. Our banking system is one of the best in the world, and, with the finances, was organized by Mr. Kemmerer, who was in Colombia one year, and after that time went to the Reparation Conference at Paris as the Delegate of the United States.

English people are always welcomed in Colombia, which knows the honesty, the loyalty, and the intelligence of your countrymen. There are in this hall some gentlemen who know Colombia and who could endorse what I have said: Sir Maurice de Bunsen, Sir Henry Galway, Sir Percy Wyndham, Mr. Cunninghame Graham, for instance.

The CHAIRMAN: Mr. Cunninghame Graham is here. We should be very glad if, with his great knowledge of South America, he would come up to the platform and address us.

Mr. R. CUNNINGHAME GRAHAM: If I do not come up on the platform it is because I have an idea that every one will hear me from the body of the Hall. I want to say one or two words about the most interesting lecture to which we have listened this evening. I have never been on the Santa Marta Range myself, but I have been in the valley of the Upar at the back of it. That is a deep valley which runs more or less parallel to the course of the Rio Cesar, starting to the eastward of El Banco on the Rio Magdalena, and continuing towards Maracaibo in Venezuela. It is a country that has remained practically untouched since the days of the Conquest. If you read Quesada, or if you read what any of the historians, Castellanos or Piedrahita, say about that valley, you may take it that it is practically the same to-day.

I regret that Mr. Wollaston was unable to penetrate to the other side of the range. It is said that there are tribes there who are cannibals even to-day. I do not know whether that is the case, but in talking to Colombian vaqueros who have taken cattle from El Blanco to Maracaibo in Venezuela, I have often heard them say that when they have lost men at night, their bodies were invariably taken away; but whether they were eaten or not they were unable to say. I do not for a moment say that this is at all a definite proof of the existence of cannibal tribes in that region. I only put it forth as a rumour set about by those vaqueros or cowboys who, in the exercise of their

occupation, travel that route ; but it is a sufficiently interesting rumour, and I hope that Mr. Wollaston on his next expedition will be able to pass the range and find out if such tribes really exist. I do not want him to fall into the hands of the cannibals, but I hope that he will add to our scanty stock of knowledge of that almost unknown region. I thank him very much for his interesting lecture, and I heartily wish him success in his next journey.

Dr. LONGSTAFF : I believe it is true that I suggested to Mr. Wollaston that he should go to this region, the only snowy mountains on the Atlantic side of the Americas, and almost on the Equator, and which I knew must be a very interesting range ; but I seem to remember that it was Dr. Vaughan Cornish who first called my attention to it. I knew very well that it would be an infernally beastly journey, and I was very anxious that some one who had more experience of tropical countries and tropical mountains than I have should make the first reconnaissance, because, of course, the conditions of travel were completely unknown, except for Mr. Simons' crossing. I must say that when I heard that Mr. Wollaston was taking his wife I rather trembled for my life when he should return. There is no horror or difficulty or hardship of mountaineering to compare, I think, with ticks or leeches. Travelling in country infested with those things is terribly trying. Mr. Wollaston and I are both members of the Alpine Club, and I think we both know very well that no mountaineer could possibly blame him for not going on from the point he mentioned, which was apparently only 8 miles away as the crow flies, but was a very great deal further as he would have to crawl, had he been allowed to by the natives.

The Santa Marta Range must obviously be a very interesting one. Glaciers in tropical countries are anomalies which must be accompanied by curious survivals both of animals and of plants, and it would be extremely interesting to know whether there are evidences there of more than one glacial epoch. In the paper, which I have had the privilege of reading, Mr. Wollaston says, I think, that there are distinct glacial evidences down to 11,000 feet. In a forest region it may very easily be that older glacial evidences are completely covered by vegetation. Then there are other questions. For instance, are there not indications of desiccation in the country? Is it quite certain that the destruction of the forests, the remains of which we saw on the screen, is due entirely to cutting for firewood? These mountain sides have exactly the same appearance as the slopes on the north side of the Caucasus. The north side of the Caucasus is inhabited by Moslem tribes, while the south side is inhabited by Christians. The Moslem tribes are pastoral people, owning sheep and goats, and they have completely destroyed the forests on their side of the Caucasus, and a great many of the landscapes we have seen pictured to-night look as though they had been denuded of trees by animals. If that were so it would, of course, confirm Mr. Wollaston's suggestion that there was formerly a much greater population in the country. I think that is certain, because of the cyclopean roads made of large blocks of stone that he saw. Is it likely that the hypothetical cattle and the roads are of Spanish origin? He did not find any buildings, probably because he was not allowed to do so. He no doubt ran a good many risks that he has not told us about, and was not justified in running into any more danger ; but I think there can be no doubt, from what we have seen to-night of the character of the Indians, of their clothing and of the patterns upon it, of the construction of that very remarkable bridge, and of the architecture of their religious buildings, that they are a so-called down-grade people exhibiting vestiges of a civilization

"DIVINING" CHAIRS

PUEBLO VIEJO

"RELIGIOUS" HOUSE ABOVE SAN MIGUEL

ARHUACO HOLY MAN

TAKING COCA

TYPICAL CAP AND MUCHILA OF MALE ARHUACO

ARHUACO WOMAN

which formerly had a much higher development. The stone-built roads must lead somewhere. Roads are not made by what we are pleased to call the ordinary barbarian, and it almost looks as though a civilization once existed in those mountains comparable to that of Mexico or Yucatan.

I congratulate Mr. and Mrs. Wollaston most sincerely on having made a most valuable—and very trying—reconnaissance. Mr. Wollaston, as a mountaineer, has indicated the only way in which any farther progress can be made in these mountains. Evidently the greatest obstacle to the increase of our knowledge of those regions is the mental attitude of the natives. I do not know that anybody is more quailfied to overcome that than Mr. Wollaston, and I sincerely hope that he, or somebody equally qualified, will persevere, and go back to Santa Marta, and tell us something more of the physical geography and ecology of the district: his imitators may rest assured that they will find more danger and difficulty to overcome than the lecturer has permitted himself to indicate.

Sir HENRY GALWAY: I had the good fortune to visit Colombia last year. I spent part of the summer between Baranquilla and Bogota, and the greater part of that time in Bogota itself. What we have heard to-night about the Sierra Nevada has been extraordinarily interesting, and shows what discomforts have to be contended with by the explorer and mountaineer. I went out to Colombia on business, and during the whole time I travelled in luxury as compared with Mr. and Mrs. Wollaston's experiences. First of all I went some 700 miles up the Magdalena river in a stern-wheeler, which was quite comfortable, though the food was not too good. The only drawback, next to the heat, was the insects at night. After landing from the steamer we had to travel about nine hours by train to the capital, Bogota, a city of about 180,000 inhabitants. I was there for two months, and I saw a great deal of the business side of the capital. Their banking system is perfectly and wonderfully sound. The reason for that is that about two years ago one of the banks, the Banco Lopez, broke. They then got advice from America. A Mission of Financiers was formed, under the Chairmanship of Mr. Kammerer, and the whole banking system was put on such a basis that the breaking of a bank now is almost an impossibility. Each bank supports the other, and behind them all is the gold reserve and the Bank of the Republic, which was formed under the auspices of the Government of the country after the breaking of the Banco Lopez.

I have been practically all over the world: I went to all sorts of places inside and outside the Empire when I was in the Army and under Foreign and Colonial officials, but I think Colombia is far the richest country I have ever seen. I have never seen such a rich country. It is a beautiful country as well. The country in the mountains and tableland of Bogota is among the finest that I have seen, and it is rich passing one's highest imagination. It is a coffee-producing country, its export of coffee being the second largest in the world. It does not export a very large quantity as compared with Brazil, which is the largest exporter of coffee in the world, but Colombian coffee is much finer than Brazilian coffee. That is shown by the fact that the price of Brazilian coffee to-day is 120*s.* per cwt., while Colombian coffee fetches 160*s.* Colombia is also a most magnificent cattle-raising country. It is full of cattle, and many of the stock-owners on the Bogota plateau own English prize cattle. The cattle-raising industry could be developed to an extraordinary degree.

Then we have heard to-night about the bananas which are grown in the

Santa Marta region. I came home in one of the comfortable banana boats of Messrs. Elder & Fyffe mentioned by Mr. Wollaston. I always take off my hat to any fruiterer who sells me a banana for twopence. How it is done I do not know! The banana boats travel one way empty; they go out empty from this country, not taking any cargo of any sort with them, so that the holds shall be kept clean, and not be in any way spoilt for bringing the fruit home. Practically the whole cargo on the boat I came home in was unloaded at Rotterdam, and they lost thousands of bananas in the process—they fell off the bunches—yet I have to pay only twopence for a banana in London!

Apart from that, the country is rich in other things. There are emeralds which are produced at the mines owned by the Government, which has a monopoly of all the emeralds coming from Colombia, and a world monopoly since the Russian mines were closed down. Then there are gold, platinum, and oil. The future of the oil industry in Colombia is extraordinarily bright. I am not an expert in that or in any subject, but I am told that the oil in Colombia has already proved to be of very high quality as containing more petrol than the oil found in Venezuela next door, and more than in Trinidad oil. That means that you can carry your oil home for the same price, and when you get it home you can produce more petrol from it.

Altogether I found that Colombia was a wonderful country, and one which I should like to revisit. It wants immigrants more than anything else, and it wants railways. It has quite a large stretch of railway in patches, some of which are good and some of which are bad. They build their railways in places where it is easy to build them, and then when they come to a hill they begin to build on the other side, so that there are gaps between. But, taking it all round, it is a country that is coming on tremendously. The people are very keen for English capital to be invested there. For the last two years past the Government has been paid five million dollars per annum in respect of the Panama indemnity, and that money has been put to the very best use in building railways and other public works. There are three more annual instalments to come. They have also huge ropeways, and the amount of carrying that is done by those ropeways over the mountains is most interesting. We were made very welcome in Bogota, and most hospitably treated. We were taken everywhere and told everything, and they showed us that the Government, the business people, the bankers, and all of them wanted English capital in the country.

In conclusion, may I say that I have listened to Mr. Wollaston's paper to-night with great interest, and I should like to thank him for the very pleasant evening that he has given us in telling us about the range of mountains which I saw from the steamer as I left the country.

The CHAIRMAN: The lecturer has given his lecture the modest title of "A Preliminary Reconnaissance." I think if most of us were to take such a reconnaissance we should be rather proud of ourselves when we came back. Mr. Wollaston has discovered a great deal that is new in a corner of Colombia that has been traversed so far by one Englishman for a short distance only. With the lecturer I must warmly couple the name of Mrs. Wollaston, who must have endured a great many hardships and discomforts in the course of the journey. Mr. Wollaston tells us that there is a great deal more to be discovered there; and Dr. Longstaff has given us some useful information as to the sort of things that might be found farther on in the range when the next expedition goes there.

I should like heartily to thank Mr. Wollaston in your name for his very

interesting lecture, and to wish him the best of success if he ever goes out there again.

The following note, to be added to the Discussion, has been communicated by Mr. T. Albert Joyce of the British Museum.

The Colombian tribes met and photographed by Mr. Wollaston constitute, from the point of view of their physical characters, a very interesting group. It is more or less agreed amongst anthropologists that the population of the Americas stands, physically, nearer to the Asiatic than to the European ; and it is usually held that America was originally, in the main, peopled from Asia, though the number and date of the migrations, and the state of civilization already attained by the immigrants, are still matters of dispute.

While the range of physical type among native Americans is wide, the tribes tend to fall into two main divisions corresponding very fairly with the two great groups of Mongolians, Northern and Southern. And a persistent feature of both is the long, lank black hair, circular in section, and with no trace of natural wave. This too is a dominant trait of the Mongolian stock as a whole. It is therefore rather a surprise to meet among these Colombians so many men with definitely wavy and almost curly hair. This feature is not, apparently, so frequently seen among the women, who for the most part are easily recognizable as "Americans." But certain of the male individuals photographed by Mr. Wollaston might well, but for certain details of costume and equipment, pass for inhabitants of Afghanistan or Baluchistan. It is greatly to be hoped that an early opportunity may be found for carrying on investigations into the ethnography and language of this people.

THE OXFORD UNIVERSITY ARCTIC EXPEDITION, 1924

Appendices to the narrative by Mr. F. G. Binney published in the July Journal.

I. THE BIOLOGY IN RELATION TO THE GEOGRAPHY

C. S. Elton

1. Ecological Survey.

DURING the summer of 1921 a general survey of the animals and plants of parts of the west coast of Spitsbergen was carried out. The results of this work were published in the *Journal of Ecology* (vol. 11, 1923). In 1923 the survey was extended to many parts of the north coast (Liefde Bay, Wijde Bay, etc.), and of North-East Land and the islands and shores of Hinlopen Strait. During the last expedition (1924) this general survey was so far completed that it is now possible to construct a map of the main climatic zones of Spitsbergen, based on the distribution of the animals, and more especially of the plants. This work has of course involved extensive collecting, and the material has been or is now being worked out by experts. It would not have been possible to produce the general survey results at all without the aid of all these gentlemen, and in particular the help of Professor E. B. Poulton.

The regions from which new data were collected in 1924 include Green Harbour, in Icefjord ; King's Bay and Deer Bay, farther up the west coast ; Liefde Bay, Bock Bay, Wood Bay, on the north coast ; and the various parts

of North-East Land visited by our parties. In addition to the work of general survey, I decided to carry out intensive ecological work in one small area. The place chosen was Reindeer Peninsula, Liefde Bay, partly because the base camp was there, and partly because it is one of the few spots in Spitsbergen where reindeer country can still be studied in its original state. In most other places the deer have been destroyed by man, but in Liefde Bay there are still a certain number left, although they have been sadly diminished in recent years. It seemed to me important to place on record some of the effects of the presence of these deer on the vegetation, and therefore on the animal life, before they are wiped out completely. The work done at Liefde Bay included:

(*a*) Detailed study of the plant and animal associations.

(*b*) An attempt to ascertain the general food-cycle among animals there.

(*c*) Study of the food and habits of the reindeer.

(*d*) Determination of the method by which stone and mud polygons are formed, since these and other surface weathering phenomena deeply affect the local distribution of animals and plants living there.

The results of all this work have not yet been completed, but it may be of interest to give a short account of the various climatic zones into which Spitsbergen can be divided, on the evidence provided by animals and plants. The main gradient of climate in the Spitsbergen archipelago is from east to west, owing to the fact that a comparatively warm current washes the west and north-west coasts, while pack-ice invades the north-east and east coasts, even in summer. There is also a well-marked secondary gradient of climate up each of the long fjords which run up into the land at so many points along the coast. This is apparently caused by warm winds which flow down the glaciers from the inland ice, and prevent the formation of fog in the inner parts of the fjords. Round the outer parts of the coast, near the mouths of the fjords, there is much more fog. Now air temperature matters comparatively little to arctic plants; it is the insolation temperature which matters to them. Thus the amount of fog, by affecting the amount of insolation, controls the distribution of many of the important Spitsbergen plants. The country can be divided into four main zones, which, of course, grade into one another to a large extent.

Zone 1 includes the barren parts of North-East Land, Hinlopen Strait, and the north-east coasts of New Friesland. It is characterized by the absence or great sparseness of vegetation, although a climax association of arctic willow (*Salix polaris*) or woodrush (*Luzula confusa*) is reached in places. The arctic poppy (*Papaver nudicaule*, var. *radicatum*), which is comparatively unimportant in other zones, here flourishes exceedingly, and is often of great size (as in Ulve Bay).

Zone 2 includes the foggy coast belt of the west and north coasts of West Spitsbergen, the interior of the fjords opening into Hinlopen Strait, and probably the interior of Lady Franklin and Brandy Bays on the west coast of North-East Land. The indicator plant is the mountain Avens (*Dryas octopetala*), a common dominant on dry gravelly soils. The plants of Zone 1 also occur. As examples it may be noted that *Dryas* occurs on Prince Charles Foreland and Reindeer Peninsula, where *Cassiope* is absent. It also occurs on Grey Hook, in the inner parts of Treurenberg Bay, and near the mouth of Lomme Bay. It is very interesting to note that H. M. Clutterbuck observed *Dryas* growing abundantly on Oxford Peninsula at the head of Wahlenberg Bay, although it is absent from the Gelden Islands at the mouth of that fjord. Malmgren records it from Brandy Bay, on the west coast of North-East

Land, and it may occur also in Lady Franklin Bay. At any rate, it seems clear that the same gradient of climate exists up the fjords in North-East Land as in other parts of Spitsbergen.

Zone 3 extends further in towards the heads of the fjords, where there is less fog. The species already mentioned occur, but the indicator plant is the white bell heather (*Cassiope tetragona*), a common heath dominant in these places. This species hardly ever occurs on the coast belt, *e.g.* it is absent from Reindeer Peninsula in Liefde Bay, local on Cape Roos some miles into the bay, and abundant at the head of Bock Bay, further in still. In Icefjord it occurs very locally at Green Harbour near the mouth, and very commonly further into Icefjord. It also occurs in the inner parts of Treurenberg and Lomme bays, but is absent from North-East Land.

Zone 4 includes the innermost parts of the western fjords of the west and north coasts of West Spitsbergen. All the species mentioned so far occur, but there are also certain others which are usually found only at the heads of these fjords, e.g. *Saxifraga aizoides* at the heads of Bock Bay, Wijde Bay, and Icefjord (this species, however, has a wider range in the south of Spitsbergen). Similar cases of distribution occur among some species of animals, *e.g.* certain spiders, beetles, and hover-flies.

2. Ornithology.

In spite of the unfavourable weather experienced this year, a number of interesting observations were made upon the birds of Spitsbergen. An account of this work by F. A. Montague will appear shortly in the *Ibis*. Special attention was paid to bird photography by A. N. T. Rankin, who was successful in obtaining photographs of many nesting birds, amongst which may be mentioned the Ivory Gull, Sabine's Gull, Brent Goose, Turnstone, and other wading birds. The general ornithological work included observations on feeding and mating habits, flocking, migratory movements, etc., but the following points are of special interest:

(*a*) The nesting-place of the Sanderling, discovered by Dr. Longstaff in 1923, was again visited, and a nesting bird was found. The eggs were not taken.

(*b*) A pair of Great Northern Divers was again seen on the lakes in Wijde Bay, but no nest could be discovered.

(*c*) A visit was paid to the nesting-place of Sabine's Gull, in King's Bay, and photographs and one egg obtained, together with some new facts about the habits of the birds.

(*d*) Two nesting colonies of the Ivory Gull were discovered, in Wahlenberg Bay and at Cape Torell, on North-East Land. Little is known about the home-life of this bird in Spitsbergen, and the expedition was fortunate in obtaining excellent photographs and a cinematograph record of the birds on their nesting cliffs. Additional knowledge of the food and habits was gained, also a complete series of stages in the development, from eggs to adult.

(*e*) A specimen of Bewick's Swan, a species which has hitherto been only vaguely reported to occur in Spitsbergen, was shot on Oxford Peninsula at the head of Wahlenberg Bay. As already pointed out, this piece of land forms a comparatively fertile oasis in North-East Land, rather resembling Reindeer Peninsula, in West Spitsbergen.

Finally, it may be noted that Montague's work confirms Dr. Longstaff's suggestion that North-East Land forms a very distinct ornithological region, characterized mainly by the absence of many species occurring in other parts

of Spitsbergen, and by the presence of the Ivory Gull, nesting in numbers. Both these facts are correlated with the proximity of the ice-pack, since the Ivory Gull depends for its food mainly on carcases of ice-pack seals killed by bears, while the severity of the climate drives away other birds.

3. Special Problems.

(*a*) *Relict Lagoons.*—Associated with the rising of the land which has been going on recently in Spitsbergen, is the cutting off of tidal lagoons from the sea; these lagoons often contain marine or brackish-water animals which acclimatize themselves to fresh-water conditions and continue to live in the lagoons after they have been converted into land-locked freshwater ponds or lakes. Complete series of such stages from marine to fresh-water lagoons can be studied in Spitsbergen, and a knowledge of their fauna is important in giving a clue to the origin of many fresh-water animals now found in lakes in North America and Europe. Such series were studied in Liefde Bay, and certain relict crustacea discovered in fresh-water ponds which had been formerly connected with the fjord.

(*b*) *Dispersal of Animals.*—Enormous swarms of hover-flies (*Syrphus ribesii*) and winged aphids (*Dilachnus piceæ*) were encountered on the ice-cap of North-East Land by all three of the Oxford sledging parties in August. The interest of this occurrence lies in the fact that the insects were European and not Spitsbergen species, and have been proved to come from the north of Europe on a gale of wind, over a distance of some 800 miles. The full details of this remarkable case of animal dispersal will be published shortly in the *Trans. Ent. Soc.* (London).

II. GEOLOGY AND GLACIOLOGY

K. S. Sandford

The following summary contains a few points of interest arising from geological and glaciological work done in 1924. This and other work will be dealt with in full and published elsewhere in due course. For convenience, provisional names are used for places and prominent features; such names were adopted in the course of the work of the expedition.

Geology.

Considerable additions have been made to the geology of North-East Land, and it is now possible to gain a fair idea of its construction.

Existing geological maps show a northern mass of Hecla Hook (Lower Palæozoic) rocks, granite, and gneiss, trending almost north and south, along the known parts of the north coast, and Hecla Hook is shown as far down the west coast as the mouth of Wahlenberg Bay. But in the western sector rock has been mapped over a large area which in reality is covered by ice.

To the south of this region little rock is marked on the maps; but such as there is appears defined as Permo-Carboniferous, and, in the south-west corner, Trias.

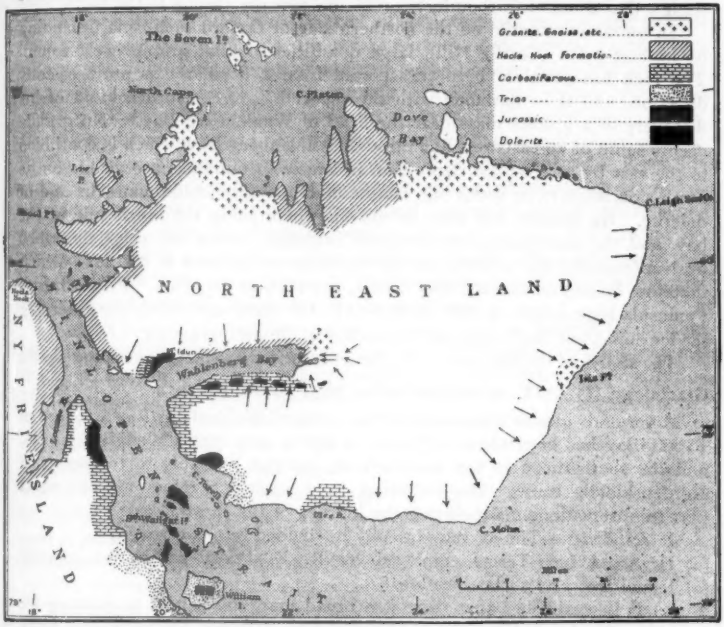
In 1923 C. S. Elton found a considerable area of Carboniferous rock on the south coast, in Ulve Bay.

In 1924 work was started on the north coast owing to the grounding of M.S. *Polar Bjorn* on a reef off Low Island. Opportunity was thus provided for a study of the fringing reef and adjacent parts of Low Island. Both proved

to be of the Hecla Hook formation, and an interesting monoclinal flexure was proved which plunges vertically near the edge of the continental shelf.

A visit to the east coast to land the third sledging party resulted in the discovery of a spit of land (Isis Point). The doctor, H. W. Florey, brought back most useful geological information which showed the point to consist mostly of granite, with a metamorphic rock the relations and affinities of which have not yet been determined.

The geological survey of Wahlenberg Bay, first from the ice-cap by the central sledging party and later by ship, has added considerably to our knowledge of the sub-glacial geology of North-East Land. Nearly the whole of the



Provisional Sketch-map of Geology of North-East Land, showing general relations. The outline of the map is adapted from A. G. Nathorst ('Bull. Geol. Inst., Upsala, vol. 10, 1910–11), also the geology of the north coast, and of certain other parts. The outcrops bordering Wahlenberg Bay, especially dolerite, are sketched in only. The island, really two islands, at the mouth of the Bay should have been shown as dolerite. The arrows indicate the known flow of the ice.

north side of the bay consists of rather gently folded Hecla Hook rocks, which were mapped in some detail. They were seen also to stretch some distance beyond the newly discovered head of the bay (Oxford Peninsula) in northerly and easterly directions, until submerged under the dome of ice.

The northern mass of older Palæozoic rock and granite thus extends to a line roughly east and west along the northern margin of Wahlenberg Bay; granite, which is believed to occur near the north-west corner of the bay, reappearing at Isis Point.

The south side of the bay is formed by a magnificent cliff, some 1100 feet high, of Upper Carboniferous rocks from which fossils were collected. Near

the top occurs a sill of dolerite which, in common with the rock it intrudes, is horizontal or dips almost imperceptably to the south. This great barrier stretches from the mouth of Wahlenberg Bay, along its south side, and far beyond its head into the interior, where it disappears beneath the ice. Rocks of the same age, with dolerite, appear on the north side of the bay, near the mouth, and form Mount Idun.

Horizontally bedded Carboniferous rocks are thus seen to lie across the edges of the Hecla Hook formation, and, as already stated, they are now known to occur on the south coast.

A study of the moraines on the north side of the bay showed, among other things, that zones of Carboniferous rock underlie the ice-cap to the north.

In morainic material on the northern side of Oxford Peninsula, including its highest point (Carfax Hill), large quantities of pink granite were found. The rock has certainly been transported from a northerly or north-easterly direction, and is in harmony with the report by A. E. Nordenskiöld of his discovery of a granite mass near the head of Wahlenberg Bay.* No granite occurs south of an east-west line through Wahlenberg Bay, which is continued to the east by an ice-filled depression in which no nunataks are visible on its north side, while to its south they consist of Upper Carboniferous rocks and of dolerite. No granite was seen *in situ* anywhere along the north side of the bay, and the assumption, on geological evidence, is that the ridge described by Nordenskiöld lies to the north or north-east of the head of the bay—which therefore he met at its north-east corner, not at its eastern end. From Oxford Peninsula high ridges of rock were seen to the north and north-east, piercing the ice dome, but they could not be reached in the time available.

The shores of the bay bear well-preserved raised beaches, containing shells.

Glaciology (§§ I.–IV. in collaboration with R. A. Frazer).

A very fair idea of the ice conditions north of Wahlenberg Bay and east of Ripp's Bay has been obtained by the northern and central sledging parties, and the southern party has traversed the interior probably to the south of Nordenskiöld's route. The following brief summary refers for the most part to observations made during the journey of the central party.

I. *Ice Zones.*—The ice may broadly be divided into two zones:

(*a*) Highland Ice } Terms employed by R. E. Priestley † in his general
(*b*) Island Ice } classification.

(*a*) It is established that there is a broad marginal belt of undulating ice country, with definite ice valleys. On the route followed by the central party parallel to, and some miles distant from, the north side of Wahlenberg Bay the valleys were found much broken by parallel lines of crevasses set close together; the intervening strips of higher country were found to be rather flat, sloping gently to the south. The major part of the journey of the central party was over Highland Ice; no valley glaciers were encountered, and the later survey of Wahlenberg Bay (by ship) showed that the ice flows directly into the bay or loops back round patches of land thickly strewn with morainic material, from which it has retreated.

The northern and central parties noted that the "Ice Wall," as marked on the Admiralty Chart, does not exist.

* 'The Arctic Voyages of Adolf Eric Nordenskiöld,' p. 262. Macmillan & Co. 1879.

† See C. S. Wright and R. F. Priestley, 'Glaciology. British (*Terra Nova*) Antarctic Expedition, 1910–1913,' p. 142. Harrison & Sons. London, 1922. Also J. M. Wordie, "Present-Day Conditions in Spitsbergen," *Geogr. Jour.*, 58, 1921, p. 38.

(*b*) The more central and higher part of the interior, probably above 2000 feet, forms a very flat and featureless dome; at a height of about 2000 feet (uncorrected) the central party still found cracks in the ice about 1 foot 6 inches broad with running water in them (Farthest Point). As the undulating zone is approached the cracks, retaining their parallelism, become more numerous and widen into prominent crevasses in the ice valleys. The latter form at their upper end great amphitheatres, with the crevasses simulating, when seen from above, contour lines on a map.

II. *Drainage*.—On the floor of the ice valleys numerous lakes of considerable size were observed by all three parties. The difference in colour of adjacent lakes was often most marked, ranging through brilliant and delicate shades of green and blue. On the return journey of the central party, which approximately followed the outgoing route, many of these lakes had increased greatly in size owing to extensive melting; thus a broad valley, which had been crossed dry-shod on the outward journey, had to be turned by a wide *détour*. Lakes sometimes occurred in spite of the presence of numerous crevasses.

During the summer melting takes place on an enormous scale, especially in the zone of Highland Ice. On the flatter parts where crevasses are not so marked, the surface is converted into an almost impassable morass or is trenched at intervals of a few yards by swift torrents which cut several feet into the ice. At the borders of ice valleys, where crevasses abound, these torrents plunge into the depths of the ice in a most impressive manner, leading to an extensive englacial, and probably subglacial, drainage system.

Another feature of the drainage is the roofing over of some of the streams by clear ice; this was observed in parts of ice valleys where crevasses were not the dominant feature. It may be consequent on the drifting of snow during blizzards and the subsequent conversion of snow into ice. The result is a type of channel which is best described as a drainpipe or conduit—a high arch of ice, standing above the level of the su rrounding surface, into which streams disappear. In one case a lake was seen to drain into a series of these, running side by side; open crevasses passed under the lake, but did not appear to drain it. Such pipes were seen running for considerable distances.* In places the roof is burst and the blocks of ice are forced up to form a small conical peak. Ice cones of this origin did not appear to exceed about 15 feet in height.

The southern party observed similar conduits near the east coast.

The bottoms of ice valleys may be filled with snow by blizzards to a depth of some scores of feet; when melting sets in the snow is washed from below by water following the surface of the ice, and the entire area becomes undermined and dilapidated. Valleys in such a condition become impassable for sledges under the plus-temperatures (C.) of summer. The central party was checked by such an obstacle at its farthest camp and, owing to a persistent thaw, was never able to negotiate it. On the return journey, an upper valley basin, which gave the appearance of being filled with innocent powdery snow, was found to be acting as a collecting ground for a heavy run-off of water from the surrounding slopes. In testing the edge of the area one of the party entered slush and snow-covered water which increased in depth as far as he could make his way. All surrounding crevasses were filled with water: the valley most probably contained a large lake beneath the snow filling, which was virtually afloat, but, on the route followed across it a little farther to the south, was thick enough to withstand the weight of the party.

* See also Sir Martin Conway, 'The First Crossing of Spitsbergen,' p. 285, Dent & Co. London, 1897.

III. *Englacial Material.*—On the route followed by the central party in the zone of Highland Ice, about 1000 feet above sea-level, the ice (not the uncompacted surface snow) was found to contain much finely divided mud—grey, black, or buff; it was especially noticeable in the neighbourhood of crevasses. Analysis shows the mud to be fine, angular, rock débris. There is little doubt that finely divided material reaches the surface of the Highland Ice from the rock surfaces underlying the glacial covering. Mud was not observed on the true dome of the Island Ice.

With reference to the above the following note is of particular interest.

"Parts of the east coast of North-East Land seen from a distance of 20 to 30 miles were so dirty in colour as to give the impression of high cliffs of rock. After the *Oiland* had discovered that the east coast was clear of ice, she reported seeing unmistakable high cliffs of rock further north. We subsequently found that this was some form of dirt or mud in the ice." (Note by Binney.)

IV. *Crevasses.*—The extensive scale on which crevasses occur has already been indicated: also their arcuate arrangement, bending up the ice valleys. They occur often on level plateaux, and are then straight; they normally run in parallel formation.

At the head of the ice valley which was negotiated by the central party on an offset journey from its farthest camp to the dome of the Island Ice the gradient was somewhat stiff and ice-falls of some magnitude were encountered. Similar falls were observed at the heads of other valleys. The central party met crevasses up to about 30 feet in width. Although crevasses occurred normally in parallel systems, occasional wide cross-crevasses were found cutting the main system at right angles, thus presenting a *cul de sac*. Individual crevasses normally possessed parallel and vertical sides, but in certain areas the changes of width were such that within a foot or two an unimportant crack developed into a cleft impassable to sledges. Such changes, as well as the crevasses themselves, were often treacherously masked by snow.

The northern party met similar general conditions of drainage and crevasses, especially near the head of Murchison Bay; but on the north coast, near Extreme Hook, the ice does not appear to have been so dissected by crevasses. On the return route followed by this party across the dome the narrow, straight cracks of about 1 foot 6 inches were noticed for some miles after the Highland Ice had been left.

It is expected that, when all available data have been coordinated, it will be possible to construct a fairly accurate profile of the northern dome from Wahlenberg Bay to the north coast.

The central ice-terrain of North-East Land drains into a great amphitheatre lying east of Wahlenberg Bay; Nordenskiöld probably saw this area from the northern dome, and he may have entered it; the southern party, in its traverse of the island, sledged into it and then traversed southwards across it. It was under the observation of the central party for about a fortnight, and is notable for the abnormal dislocation of the ice and for the grand scale of the crevasse systems. From its high position to the west the central party could see that the same parallelism of crevasses was maintained here. Binney found similar crevasses up to 100 feet in width.

Question will naturally arise as to the "ice canals" and "docks" described by Nordenskiöld.* On the routes followed by the three sledging parties of the 1924 expedition no feature *exactly* tallying with Nordenskiöld's description

* 'The Arctic Voyages of Adolf Erik Nordenskiöld,' pp. 258–261. Macmillan & Co. 1879.

was encountered. Wide crevasses (both open and snow covered) with parallel vertical sides, running in a straight line for long distances, were frequent enough, and they occurred in close systems and parallel. When open, they were often partly choked with snow, and they were certainly of very great depth; but a definite "floor," either of ice or of snow, was never seen

It should be remembered that the southern party passed near the position given by Nordenskiöld as that at which he encountered ice canals—*if it is to be assumed that the route marked on his map is correct.* The crevasses met here by the southern party were as described above: they had no "floor." It is not intended here to enter on a long discussion of ice canals; precisely as such they were not encountered by the parties of this Expedition in July and August of 1924. Actually, if the above and Binney's accounts of crevasses be compared with Nordenskiöld's ice canals, much in common is to be found—except for the absence of the "floor" on which it was possible to camp in June 1873. From this statement, however, it must not be assumed that the present and the former accounts are of homologous features.

The southern party, in wandering (in fog) on to the Eton Glacier, entered a terrain of extremely broken and jagged ice surface, in which the above regular system of crevasses was replaced by great confusion of ice.

The Eton Glacier drains the amphitheatre already described and enters Wahlenberg Bay in deep water, and the great terminal ice-cliff, about 100 feet in height, is evidently afloat along part of its length. The shattered nature of the centre line of the course of the glacier is very impressive and was well seen from a distance by the central party. It is not a valley glacier; nunataks appear to the south, and ice flows between them to join it; to the north are ice slopes, except near its western end, where rock appears; at its head is the central amphitheatre of North-East Land.

V. *Moraines.*—A very extensive belt of boulder clay and of morainic material marks the north side of the end of the Eton glacier where it impinges on Oxford Peninsula. There are great moraines along the north side of the bay in places where the ice does not now advance directly into the water: when it is remembered that no nunataks project through the ice in this region, though high ridges appear at the actual edge of the ice, an impressive idea is gained of the great bulk of material which is being removed from the subglacial rock surface. At one place, near the depôt of the northern and central sledging parties (Cape Braag), morainic material was found at a height of 500 feet resting on solid ice; no nunatak or rock pierces the ice anywhere in the neighbourhood.

The great lagoon east of Oxford Peninsula (which lies entirely in boulder clay), the rotted condition of the northern end of the face of the Eton Glacier, and the large areas of comparatively recently uncovered land all point to the present rapid retreat of the ice. Further significant evidence lies in the very existence of Isis Point on the east coast, which seems only recently to have emerged from the great ice cliff which stretches from Cape Leigh Smith to Cape Mohn and beyond.

Air Conditions on the Northern Ice Dome.

All the available data have not yet been coordinated, but it is clear that there is a definite outward flow of air fron the northern ice dome which was visited by the northern and central sledging parties. This was maintained during the period of sledging (July 22–August 15), except for a few days (*e.g.* August 6–8) when a strong depression advancing from the south-west and passing South Spitsbergen seems to have overcome local conditions in North-East Land For the only time in its journey the central party then experienced

south-west winds. After the passing of the depression, flies, blown from Northern Europe, were found by all three parties (see Appendix I., Biology, by C. S. Elton). At other times the central party experienced general northerly breezes, winds, and blizzards, while the northern party received them from the south and south-west, once the dome had been negotiated. For a period of about three days the northern and central parties were weatherbound about 50 miles apart, one on the north, the other on the south of the axis of the dome; a violent blizzard was experienced, but from the south and north respectively. There is evidence to show that these blizzards, though very violent, are distinctly localized.

There is no doubt as to the outward flow of air, and as such it performs the chief function of a glacial anticyclone, *i.e.* radial transport of snow; it is not suggested that a true anticyclone exists.

The effect of wind blowing snow off the Island Ice and depositing much of it in the valleys of the Highland Ice is very marked indeed. After a blizzard the upper slopes of the dome were found bare and the ice severely cut and abraded.

It is of interest, however, that similar conditions were not experienced by the southern party; throughout its trek across the Island Ice from the east coast it encountered thick snow, waterlogged at the base.

Temperatures were generally high, often between 0° and 2° C., rising to 5° C. By the central party —5°·5 C. was recorded, but during blizzards it was unfortunately impracticable to protect the thermometers adequately, and no reliable readings were then obtained.

Heavy rain was experienced on two or three occasions by both northern and central parties, and the latter, on a cloudless sunny day with no wind and a temperature of —3°·5 C., experienced a shower of ice spicules (up to $\frac{1}{8}$ inch long), which lasted about half an hour.

When fog or mist did not prevail the upper clouds were seen to be most varied and beautiful (cirrus and high strato-cumulus). Their bearing on air conditions has not yet been determined.

III. METEOROLOGY

Capt. F. Tymms, M.C. (Air Ministry)

The *Polar Bjorn* sailed from Newcastle on June 19, arrived at Green Harbour, Spitsbergen, on July 3, and left Spitsbergen on August 3.

Meteorological observations were commenced on board the *Polar Bjorn* on June 20 and continued until July 17; the observations from July 2 to July 17 were taken in Spitsbergen waters.

Observations were commenced on shore at Liefde Bay on the north coast of Spitsbergen, lat. 79° 42′ N., 13° 48′ E., on July 19, and continued until the expedition left on August 31.

The M.S. *Oiland* was fitted up with instruments after its arrival in Spitsbergen, and observations were taken mainly in the neighbourhood of Hinlopen Strait, the south coast of North-East Land, and the north coast of Spitsbergen rom July 22 to August 29, when the ship left Spitsbergen.

In addition, certain observations of temperature and pressure (by aneroid) were taken by two of the sledging parties on the North-East Land ice-cap between July 20 and August 16. These may be of value taken with general

remarks on the weather, but the observations are to a certain extent vitiated by lack of knowledge of the exact elevation and the fact that the thermometers were not screened and sometimes not dry.

Pressure.

Pressure was generally high at Liefde Bay ; the mean for the last thirteen days of July was 1010·6 mb. The mean for the month of August was 1007·7. The general character of the weather in August was markedly worse than in July. The highest barometer, 1024·4 mb., occurred on August 19. This was preceded by a gale and followed by a three-day blizzard, common to all observation points—Liefde Bay, Treurenberg Bay, and North-East Land.

Pressure only dropped below 1000 mb. on three occasions—July 2 and 3, August 3 and 4, and August 7–11. On the first occasion, from the very definite evidence of the winds, the depression moved from south-east to north-west, but on the other two occasions the movement was normal from a westerly quarter. The approach of the first depression from an easterly direction confirms the statement of Dr. Grogenes of the Tromsö Observatory, that the path of depressions crossing the north of Norway in a north-easterly direction sometimes curves round so that they approach Spitsbergen from the east or even north-east.

Apart from the three occasions mentioned, there were no very definite depressions. Pressure was remarkably uniform. This, however, did not mean that there were no winds.

Temperature.

Temperature ranged between 50° and 29° F. at Liefde Bay. The mean temperature in July was 42°·9 F., and in August 38°·4 F.

The maximum of 50° was reached on four occasions, July 25, August 2, August 6, and August 9. These all correspond to the approach of depressions with south-to-west winds, and not to periods when the sun shone brightly.

A temperature of 58° F. was recorded by the *Oiland* in Treurenberg Bay on August 8, at 10.00. This was observed on the ordinary dry bulb, and may not therefore have been the absolute maximum. This temperature coincided with a Force 6 wind from south, associated with the advance of the depression of August 7–11. This wind could only reach Treurenberg Bay after crossing the New Friesland plateau at about 2000 feet ; the change of level may therefore have influenced its temperature.

Temperatures of over 50° F. were recorded on the *Polar Bjorn* in various positions between Green Harbour on the west coast and Liefde Bay on the north coast, on every day between July 5 and 11. The highest was 55° F. on July 8 at Dane's Gat (North-west Corner). This was an exceptionally sunny period.

No sun temperatures were recorded, but it is worthy of note that on several of these days (but no others) it was quite pleasant to do manual work stripped to the waist.

The minimum temperature recorded was 29° F. on August 27. Temperatures of or below 32° F. were recorded on eleven days—12th, 18th, 19th, 22nd, and every day from August 25 to 31. From August 26 onwards the thermometer did not rise above 32° F.

Humidity.

Relative humidity was high and ranged between 66 per cent. and 99 per cent. The mean for July was 81·7 per cent. and for August 89·4 per cent. In August the relative humidity did not fall below 75 per cent.

Practically throughout the whole of August it was impossible to keep clothes dry, and the high humidity greatly exaggerated the apparent cold.

Visibility and Fog.

Visibility was usually extraordinarily good, except when it was interfered with by low cloud. The following figures relate to Liefde Bay:

In July 66 per cent. of observations gave a visibility of 30 kms., and on no occasion did the visibility fall below 1000 metres.

In August 44 per cent. of observations gave a visibility of 30 kms., and on no occasion did the visibility fall below 1000 metres.

There seems reason to believe that conditions differ widely between the west and north coasts. On the west coast definite fog was experienced, but on the north coast, though banks of fog, which appeared dense from a distance, were very frequently experienced; they were very patchy, never very high, and never produced really low visibility. When the observer was in one of these banks, visibility always varied in different directions. I am certain that these fogs would prove no obstacle to aviation, because even if it were desired to land clear areas could be found. These fog banks were always associated with a north-to-east wind, and were almost the invariable accompaniments of such a wind. Such winds on other occasions produced low fracto-stratus cloud.

See also remarks under "Phenomena."

Another cause of the lower visibility sometimes experienced at Liefde Bay was actual precipitation, which was not very frequent. The most common cause, however, was low cloud obscuring the points which were high enough to be seen at a distance.

On the west coast near Green Harbour low visibility with moderate intermittent fog was experienced on July 2 and 3, associated with the depression of that date.

On July 15, off Dane's Island (North-west point), a short spell of dense fog (visibility 50 metres) was experienced, associated with a slight depression of the barometer and some rain.

On July 16, in approximately the same position, fog of varying density down to a visibility of 50 yards lasted from 12.00 to 04.00 the next morning. This was associated with the same slight depression, though there was no rain on the 16th.

In Hinlopen Strait visibility is not generally so good as on the north coast. The *Oiland* records visibilities of less than half a mile on two occasions, and on other occasions visibility was impaired by mist.

Cloud and Sunshine.

No sunshine record was taken, but sunshine was continuous from July 7–9, and on July 11 throughout the twenty-four hours. There was no other period of sunshine like this, and normally spells of sunshine were brief. This interfered with aerial photography. Sunshine was rather more common at night than by day, but there are no records to support this statement.

There were no occasions on which an absolutely clear sky was observed. The mean cloudiness during the latter part of July was 4·5. During August it was 7·5.

During July the sky was completely overcast at 11½ per cent. of observations. During August it was completely overcast at 40 per cent. of observations.

During July there was low cloud, below 1500 feet, at 23 per cent. of observations, and during August at 47 per cent. of observations.

A common form of cloud in Liefde Bay was fracto-stratus, formed by cold north and east winds blowing against the sides of the mountains.

As is to be expected from the fact that the temperature gradient is low, there was practically no cumulus cloud.

Clouds at the cirrus level were very frequent and almost gorgeous in their display.

A fine display of cloud was witnessed at Treurenberg Bay at 01.00 on the morning of August 9, when the southerly gale of the 8th had not quite blown itself out. At a height of about 1500 feet clouds were blowing up at great speed from the head of the bay and appeared to concentrate in one enormous black cloud of the nimbus type over Hecla Cove, where the ship was anchored. The sky to the north remained clear, and though the sun was just obscured by the cloud the sky shone with a metallic green brilliancy. The cloud over the ship appeared to be caught in two wind currents, the one from the south coming down the bay, and another from the east, sweeping round the northern end of the range of mountains which terminates opposite Hecla Cove. The position of the cloud scarcely changed, but under the influence of the two winds its shape underwent violent and rapid changes. For some time it presented a fascinating spectacle resembling a fiercely boiling cauldron. At the time the wind on the ground had considerably moderated.

Wind.

Gales were rare. Only one was recorded on August 8.

No calms were observed in July; 15 per cent. in August.

The majority of the winds observed were light; in July 86 per cent., in August 66 per cent.

Moderate winds (15 to 35 m.p.h.) amounted to 14 per cent. in July and 17 per cent. in August.

The most noticeable feature of the wind was the sudden and rapid changes to which it was subject.

The most frequent wind during July was north, followed closely by south.

During August the most frequent winds were north and north-west, followed closely by east. There were very few south winds.

Precipitation.

In July there were only two days on which precipitation occurred, the total amount being 2·6 mm., all of which fell as rain.

In August there were thirteen days of precipitation, though there were twenty days on which some precipitation was observed. The total amount registered was 17·9 mm.

Snow fell at Liefde Bay on twelve days in August.

State of Ground.

Aero Camp was established at sea-level on the southern shore of Reindeer Peninsula. The following description of the condition of the surface of the ground will therefore give some indication of the seasonal change. Very much fuller observations on this subject were made by Mr. C. S. Elton, the ecologist of the expedition.

Reindeer Peninsula is a stretch of country about 10 miles by 6 miles, having a maximum altitude of 350 feet, consisting of stony ground covered for the most part with lichen, moss, and sundry stunted plants, mostly of the saxifrage order. The peninsula is dotted with numerous small tarns.

On July 9 the whole of the shore was lined with a continuous snow foot, anything up to 5 feet in thickness. In addition every hollow was filled with a

snowdrift from 3 to 4 feet deep. The ground was only clear in patches, and this was in an extremely soft muddy condition due to the rapid thaw which was taking place. A man walking sank in almost everywhere 3 or 4 inches, and rapid progress was only possible by walking on stony ground.

Even on July 14, the plateau at 300 feet was for the most part covered with half-frozen, half-thawed snow.

Thawing proceeded rapidly; the snow foot was finally broken up by a storm about July 18, and most of the snowdrifts had disappeared by July 20. In their place a number of temporary pools and ponds were formed. Owing to the excellent drainage of the soil these proceeded rapidly to dry up, and the soil on the ridges became firmer. Walking now became easier, but it was not until August 6 that the ground could be entered as dry. Until then and to a certain extent after, the amount of moisture in the top soil was such that one could not kneel on the ground more than a few seconds without the moisture penetrating one's clothing. In fact, the ground never did get into the state in which it would be called dry in England.

Ground ice was discovered by Mr. Elton on August 3 at a depth of 2½ feet at an altitude of 100 feet. This was the only occasion when it was discovered. There seems to have been a general impression that it exists only a few inches below the surface throughout the summer, but as excavations to a depth of a few feet were frequently made for wells, foundations for instruments, etc., this may be considered as definitely incorrect.

The average earth temperature at 1 foot in the latter part of July was 39°·6 F., the highest recorded being 40°·9 F. and the lowest 38°·6 F.

The average earth temperature during August was 37°·9 F., the highest recorded being 42°·4 F., and the lowest 33° F.

On one occasion, July 27, there was a heavy deposit of dew.

Snow-covered ground was reported from August 27–30. Prior to that date there had not been sufficient snow to remain on the ground at sea-level, though at an elevation of a few hundred feet snow collected from the middle of August. The snow only disappeared from the coastal strip on August 30. At a very slight altitude it remained.

Ice Conditions.

No complete record is available owing to the position of the observers, but the following notes were taken:

Ice was first sighted on July 1 in lat. 75° 30′ N. and long. 15° 40′ E., approximately. Though in this vicinity there was a fair amount of floe ice, the quantity decreased as the ship drew to the westward of South Cape. Practically there was no ice on the west coast of Spitsbergen.

In Green Harbour, on July 3, there were ice-floes up to a mile in extent drifting down towards Ice Fjord. These were mainly composed of shore ice and snow. This ice had all disappeared on July 6.

In King's Bay, on July 7, there was practically no ice, except a number of small icebergs drifting down the north-east side of the bay from the glaciers at the head. These would continue more or less the same throughout the summer.

A similar condition prevailed In Dane's Gat on July 8.

On July 8 drift ice was encountered in contact with the north coast at Red Bay, and this appeared to be continuous towards the north and north-east. Its southern limit receded towards the north-west. This drift ice did not check the progress of the ship at all, but it would not have been possible to operate a seaplane. This drift ice extended all over Liefde Bay.

Liefde Bay was practically clear of ice by July 14, by which date the southern limit of the drift ice had receded beyond Verlegen Hook. Thereafter only odd icebergs were observed in Liefde Bay, as they broke off the glaciers.

This is a common condition of all the bays in Spitsbergen. Those such as Wahlenberg Bay in North-East Land, a great part of whose shores are occupied by glacier fronts, contain a great deal of ice all through the summer; others, such as Murchison Bay, which are lacking in glaciers, are generally clear of ice in the summer, with the proviso that the further north-east one goes, the shorter is the clear period, and the greater is the probability of the minor fluctuations of the pack temporarily closing a bay, until on the east coast of North-East Land there is not necessarily any clear period at all.

The first definite indication of the winter southward movement of the pack was the reaching of Verlegen Hook (80° N.) by the drift ice, on or about August 24.

On August 30 the drift-ice was still some miles north of the coast at Liefde Bay. The expedition left on August 31.

Upper Air Temperatures.

Circumstances interfered with the programme for the use of the aeroplane psychrometer, and the readings obtained cannot be used for any purpose but to support in a general way the statement that the temperature gradient is low.

On August 30, an almost cloudless day, the following readings were obtained, but they are only approximate, on account of vibration making the reading difficult :

Height.	*Temperature.*
Ground	... 35° F.
8000 feet	... 27° F.
1000 ,, ...	... 37° F.
2000 ,, ...	... 34° F.
3000 ,, ...	... 29° F.
3800 ,, ...	... 28° F.

Phenomena.

Fog Bows.—A very frequent accompaniment of the fog banks, which themselves were not infrequent, was a white rainbow—presumably of the same nature as that which accompanies the "Brocken Spectre." No trace of a spectre was visible.

Mirage.—Mirage was a very common spectacle. It usually took the form of raising the distant object, and headlands and islands appeared raised out of the water.

Mirage of this kind was frequently observed when there were fog banks about, and it sometimes happened that small rocks in the middle distance which normally were invisible against the background of other land, were separated from the background by a fog bank and at the same time raised by mirage so that they assumed startling proportions.

While at sea in the *Polar Bjorn*, the mirage of a small sealer was observed hours before she normally appeared above the horizon.

Wind Eddies.—On one occasion, July 17, what appeared to be embryo waterspouts were seen travelling over the water at a distance of a few miles from the ship, which was then anchored in Liefde Bay. The phenomenon occurred in the open water (4 or 5 miles in extent) at the mouth of Liefde Bay and Wood Bay. Small columns of water followed each other in rapid succession and at a good pace across the bay, and shortly afterwards appeared to

return. From this it was gathered that their course was circular or spiral; but there was no opportunity for a closer investigation.

They appear to be well known to the Norwegian sealers, who have a special name for them.

Ice Crystals.—On August 4 Mr. K. S. Sandford, the geologist on No. 2 sledging party, observed ice crystals falling in the following conditions. The position of the party was on the north side of Wahlenberg Bay, that is, south of the summit of the interior plateau of North-East Land.

After a very strong wind from north-north-west, the wind abated, and at 21.30 there was a slight breeze from north. The sky was clear and the temperature 27½° F., when ice crystals were observed falling from the air.

At 23.45 a strong northerly wind was blowing, the temperature was 26° F., sky cloudless, and "a mist of ice crystals and occasional snowflakes" was observed.

At 01.45 on August 5 the wind had dropped, temperature had fallen to 23½° F., and the fall of ice crystals ceased.

It seems possible that part of this fall is accounted for by the blowing of ice and snow off the interior plateau.

The following table gives a comparison of the normal conditions in August, taken over a number of years, with the observations taken at Liefde Bay in 1924:

		Spitsbergen Normal.	*Liefde Bay* (1924).
Mean.	Barometer	1012·5 m.b.	1007·7 m.b.
	Temperature	38°·8 F. (Green Harbour)	38°·4 F.
	Humidity	84 per cent.	89·4 per cent.
	Cloud	71 per cent.	83 per cent.
Total.	Precipitation	21·3 mm	17·9 mm.
	Rain days	6	8
	Snow days	1	12
Mean.	Wind force (Beaufort scale) ...	1·6	1·9

IV. AERIAL NAVIGATION IN THE ARCTIC

Capt. F. Tymms, M.C. (Air Ministry)

The prospect of Polar flights and, what is more important, the possibility of commercial air routes traversing the Arctic regions, makes the problem of aerial navigation in the Arctic one for present thought.

The experience gained by the expedition in 1924 goes a little way towards solving the problem. There appear to be many myths about the Arctic, not the least of which is that it is cold in the summer. Another important one is that the magnetic compass is no use. Both are founded on a substratum of truth, but both have been magnified to considerable bogies.

Cold.—Considerable trouble was taken in the building of the Avro seaplane to meet the first of these difficulties. Apart from the choice of an air-cooled engine, a special enclosed cabin was built and arrangements made to heat it from the exhaust. It was soon found more comfortable to cut out the heating arrangement, as the stream of hot air burnt the pilot's foot. It was always sufficiently comfortable flying with an ordinary kapok life-saving jacket in place of a flying coat.

Actually the lowest temperature recorded at sea-level was 29° F., towards

the end of August. There would have been no difficulty in running a water-cooled engine in Liefde Bay until the end of August, and most of the time it would not even have been necessary to empty the radiator.

Landing Facilities.—The problem of where to land is one of the most troublesome and depends entirely on the object of the flying operations.

Polar flying will probably prove to be very considerably bound up with Spitsbergen, because Spitsbergen is more accessible than any other place so near the Pole. This in itself will make it the base for nearly every attempt to reach the Pole by air. On the other hand, if commercial aviation over the Arctic ever comes, and this will not be in the immediate future, it will be observed that Spitsbergen lies almost on the direct route from Europe to the Pacific shores of America and Asia. Its coal industry will lead to the development of harbours, the attraction of shipping and the provision of sundry amenities of civilization, on which aviation, to a greater extent than the older forms of transport, depends. No excuse is therefore needed for the consideration of the Arctic problem with special reference to Spitsbergen.

In Spitsbergen, in different seasons, the aviator has the choice of four different surfaces for landing—land, water, snow, and ice.

The first can be at once dismissed. The greater part of the country is mountainous and snow-clad.

Restricted areas of tundra near sea-level are, in the summer, free of snow, but only for a couple of months; and during a large part of this time the ground is so soft and wet as to be unusable. None of this ground (so far as I have seen) is fit to land on at present, and it would not be worth while carrying out levelling operations to make a permanent landing ground, because of the short time during which it would be available for wheeled machines, both on account of its snow covering and its softness.

Water is available for the landing of seaplanes from somewhere about the beginning of July, though the bays on the north coast are not free until the middle of July. After the drift ice has cleared, the quantity of ice in any bay depends on the glaciers which empty into it. Some bays, such as Liefde Bay and Murchison Bay, are practically free of ice in the summer, while Wahlenberg Bay, on the other hand, is nearly always more or less choked. The bays on the west coast of the main island, such as King's Bay and Green Harbour, are to all intents and purposes clear. This condition lasts until the drift ice returns in the autumn, which may be, on the north coast, any time after the end of August, and on the west coast considerably later.

This period, during which seaplanes may be operated, is limited, and their use is further limited to local flying or flying between Spitsbergen and Europe. No expedition to the Pole could depend on finding open water for the landing of a seaplane farther north than Spitsbergen, and must therefore rely on some other form of undercarriage.

Snow-covered ground or ice requires a machine fitted with skis, and at first sight it seems that no difficulty should arise in operating such a machine. During the summer, however, snow-covered ground could only be found at an altitude, in some inaccessible spot, possibly on the upper part of a glacier or, for example, on some such place as the ice-cap of North-East Land. During other parts of the year no doubt the surface of some lagoon could be used by a machine fitted with skis. Proposals to use skis on the pack ice, before it breaks up in the spring, must be regarded with suspicion, since the whole of that surrounding Spitsbergen is undoubtedly formed by the freezing together of drift ice, and it is unlikely that any stretch of water connected with the open sea would be able to freeze over smoothly.

Provided, however, a polar flight were started early enough, it would seem possible to use skis for a start from the surface of some lagoon. It does also seem possible that landing-places might be found in the neighbourhood of the Pole, where at least the pack is more stable than it is on the fringe, and where the accumulation of years of snow fills up the minor irregularities.

Landing on bare ice would require wheels, but again this can be left out of account, because, in the first place, the surface of the sea would not be sufficiently smooth, and the lagoons, some of which would be otherwise suitable, would be snow-covered as soon as they were frozen.

A possible alternative for a polar flight would be the construction of a sea-plane with a specially designed undercarriage having skis fitted on top of the floats and an arrangement to permit of the dropping of the floats after taking off from the water.

For the operation of a regular aeroplane service, one of the most puzzling little problems is how to start from one kind of surface and land on another. It is partly solved by the amphibian when the two surfaces are land and water, but it is not yet solved when the two surfaces are snow and water or snow and land. This problem is not peculiar to Spitsbergen or the Arctic regions. It is a very real problem in, for example, the operation of a service from western to eastern Europe in the winter.

It will be realized from this that the operation of aeroplanes to and from Spitsbergen is likely, at least, to be troublesome. None of these troubles affect the airship, which, landing at its own mast, is independent of the state of the ground beneath it.

Compass.—Two aircraft compasses were carried by the expedition, both fitted with magnetic systems approaching aperiodicity. The first, a pilot's compass (Type P.2), was specially fitted with a strengthened magnetic system, to compensate for the reduced value of the Earth's horizontal magnetic force. The second, an observer's compass (Type O.2), fitted with a prismatic sight intended for the taking of bearings, was, in the event, mainly used for swinging the pilot's compass.

Both compasses were submitted to tests to determine their time of swing for comparison with that observed in England. The following mean times of swing were observed :

P.2 Compass.

Swing.	*Mean Time.*
90° to 0°	12·6 secs.
30° to 0°	12·2 ,,

O.2 Compass.

90° to 5°	14·6 secs.
30° to 0°	12·4 ,,

These times of swing are approximately double those observed in England, where H is also about double the value in Spitsbergen. They certainly do not suggest that the compass is useless, though it is more sluggish.

The chief difficulty in the use of the magnetic compass for a flight to the Pole would lie in lack of knowledge of the magnetic declination. Mr. Relf, who was responsible for the magnetic work of the expedition, observed the declination at Liefde Bay to be 11° W., and at Isis Point, 160 miles away, to be 1° W. This change compares with a similar change in Europe of 10° in about 850 miles.

Since declination changes during flight, one must take frequent azimuths of the sun.

Amundsen tried to overcome this difficulty by the use of a sun compass constructed for him by the firm of Goerz.

Based on the clockwork control of a mirror reflecting the image of the sun on to a screen, the compass can be set for any desired course and adjusted for any latitude, so as to keep pace with the change in azimuth of the sun. The machine is steered by keeping the image of the sun on a central mark. Steering by this compass eliminates the oscillation errors to which a magnetic compass is subject, and which, in bumpy weather, might be considerably more serious in a polar flight than in England, because of the increased value of the Earth's vertical magnetic force.

The sun compass would obviously have a limited value on such a route as the London–Paris route, but for a flight in the Arctic, where the sun is not such a rare spectacle, it should prove invaluable. The ideal equipment for a flight to the Pole would be a sun compass, with a P.2 aperiodic magnetic compass (on which northerly turning error or oscillation error has been reduced to a minimum) carried in reserve.

V. MAGNETIC OBSERVATIONS

E. Relf

Station.	*Declination.*	*Dip.*	*Horizontal Force.*	*Date.*
Liefde Bay	10° 35′ W.	81° 30′	0·0788 (c.g.s.)	July 16 and 23
Isis Point (east coast, North-East Land)	1° 37′ E.	81° 45′	—	August 5

The results above agree with the rougher readings taken in 1923 in showing that the declination is decreasing and not increasing, as is stated on most charts. The values are all about 1½° less westerly declination than is shown on the 1912 Admiralty Chart.

The dips are approximately what we expected.

The horizontal force reading will be useful to enable the lines of equal magnetic force to be drawn through at least one correct point in the eastern part of Spitsbergen. The value is considerably less than half its value in England (0·184). For this reason the compass is so slow and does not always come to rest in precisely the same place.

There is further a series of declinations taken at Liefde Bay on two days at half-hourly intervals. One of these happened to be on a stormy day (magnetically), and shows that the compass needle varied nearly 3° during the day.

On July 21, at 09.00 the declination was 8° 55′ 30″ W.; it rose to 10° 45′ 30″ at 13.00; fell a little and rose to 11° 34′ 20″ at 20.15. On July 23 and 24 its range was much smaller, between 9° 52′ 20″ and 10° 27′ 0″.

VI. WIRELESS

E. Relf

Following the successful use of a wireless receiving set by the sledging party in 1923, experiments were carried out this year with a view to further development. The northern party was equipped both with receiving and transmitting gear. The receiving gear was of the same pattern as in 1923. Power for transmission was made by a hand generator. The whole equipment

weighed approximately 40 lbs. Owing to the illness of the wireless operator, it was not possible to give a thorough test to the experiment. While the gear was satisfactory under good conditions in England, it was not practical for summer use in the Arctic.

Two main faults were: (*a*) the difficulty of carrying an aerial with a fair radiation efficiency on a sledge; (*b*) the hand generators did not give a sufficiently steady high-tension voltage. Consequently they gave a very variable wave-length (which would not matter on spark transmission, but is hopeless on continuous wave).

For reliable transmission of wireless messages by sledging parties, I make the following suggestions:

(1) The use of a much shorter wave-length (say 100 metres). Amateur experimenters are daily communicating thousands of miles on 75–90 metres, with 20–50 watts input. It should therefore be possible to do 100–200 miles with 5 watts.

(2) This would allow batteries to be used instead of generators, getting rid of the unsteadiness of the latter.

(3) It is unlikely that a single valve transmitter on short wave will ever be steady. One would have to develop a concentrated transmitter of the "master oscillator" type, in which one valve controls the wave-length and the other does the radiating. The wave-length then does not depend on the varying capacity of an aerial swinging in a breeze, and continuous wave working becomes easier in consequence. The receiving gear would need to be reconstructed for the shorter wave, and could probably be reduced to two valves instead of three. In fact, the high-frequency amplifier (first valve of our existing sets) would probably be impossible to handle on 100 metres. The weight of such a set would be very little (if at all) greater than the one used by the northern sledging party.

It is hardly necessary to comment on the extreme value of a wireless transmitting set to a sledging party in any serious emergency.

VII. AERIAL SURVEY

Capt. F. Tymms, M.C.

The intention was to take oblique photographs along the coast from a height of 5000 feet and at an angle of tilt of 60°, *i.e.* with the camera axis depressed 30° below the horizontal. The limitations of the machine imposed a height of 4000 feet, but otherwise this procedure was followed. An endeavour was made to obtain a 55 per cent. overlap in order to ensure that every point in the coastal strip appeared on two photographs, thus enabling either a stereoscopic examination of the prints to be made, or a graphical or mathematical determination of the height as well as position of any feature. The choice of a tilt of 60° was governed by the desire to obtain the best compromise between a plan and elevation picture of the country.

It was originally intended that the plotting of the photographs should be done stereoscopically by means of a stereoscopic plotting machine. In the event such a machine was not available, and the actual plotting is being done by graphical methods at the School of Military Engineering, Chatham. As is fairly commonly known, stereoscopic plotting machines, by an elaborate system of links, can be made to plot almost automatically the detail appearing on a stereoscopic pair of photographs, on which sufficient data is available

for them to be so set in the machine as to reproduce the conditions under which they were exposed. The graphical method depends from the same data, but is naturally a somewhat more laborious process.

The taking of the photographs calls for little comment. The camera was an all-metal hand-held camera, carrying a roll of film sufficient for sixty exposures, producing a picture 5″ × 4″. In practice, to secure a consistent overlap of 55 per cent. along a much-indented coast calls for a thorough understanding between pilot and photographer, particularly when the photographer, as in our case, operates from a cabin and has only a limited view of what is coming. Practice alone will give this understanding. Owing to the number of turns necessary, intervals between exposures varied from 5 to 40 seconds. Automatic exposure, therefore, is useless for this work. In passing, it may be said that photography is the dullest possible life for the pilot, who has to concentrate on his course, does not know what the observer is doing, and must not disturb him for fear of interrupting the chain of photographs.

The photography is merely half of the field work in an air survey. A framework must be provided on which to plot the photographs. Mr. Binney, in his paper, has given his conclusion that the survey of North-East Land must be carried out by landing parties on the coast, in conjunction with aerial photography. The wisdom of this decision cannot be doubted by any one who, from the comfort of an aeroplane, has seen the mist and clouds with which the ice-cap is so often enshrouded, the barren waste of snow of which it is seen to consist when the weather is clear, and, above all, the appallingly contorted surface of the glaciers, which look almost impassable and yet have to be crossed.

In order to calculate the constants of any tilted photograph, it is necessary to know the principal distance of the camera and the position and height of at least three, but better four, points which appear on the photograph. With this data, the tilt of the photograph and the position of the camera in space may be calculated. A perspective grid, corresponding to a rectangular grid on the map plane, may be constructed on the photograph, and by its aid the whole of the detail on the photograph may be plotted on the map.

On the adjoining photograph, since at least half of it overlaps the first, four points common to both photographs may be found, from which it is possible to determine the constants of the second. Moreover, since on each picture objects which lie above or below the map plane will be displaced radially from the plate plumb point, the true position of any object may be determined by the intersection of two lines plotted from the plumb points of the two photographs.*

There is a prevalent idea that only very prominent points, of a nature suitable for fixing by ground methods, may be used on aerial photographs. The two accompanying photographs show how one photograph may be plotted with reference to its neighbour, and the plotting thus carried across a glacier through the medium of points which have no significance and will not appear on the resulting map. Four common points consisting of crevasses or other identifiable portions of the glacier are marked. Even floating icebergs may be used for this purpose, since their movement in the interval between the taking of two consecutive photographs is negligible, and they have the advantage of providing identifiable points all at one level.

* For further information on methods of plotting air photographs, refer to "Mapping from Air Photographs," by Major M. N. McLeod, Canadian Air Board Reports, and to a new book on graphical methods of plotting which will shortly be produced by the Air Survey Committee and published by H.M.S.O.

On the scale of our photography in 1924, each photograph covers a length of about 1 mile of coast. Thirty photographs would therefore carry the survey along about 15 miles. With care, this whole series of photographs can be secured with an adequate overlap; but there would naturally be a certain cumulative error in the plotting of the photographs in which no actual fixed points appeared. If therefore the ground survey parties fixed a group of points in close proximity on one part of the coast, then landed and repeated the process about 15 miles along, the second group of points would serve to correct the cumulative error in the plotting carried along through the photographs from the first group. As far as possible the points selected for fixing should be on the coast at sea-level, to simplify the process of calculation and plotting due to fixed points at different altitudes.

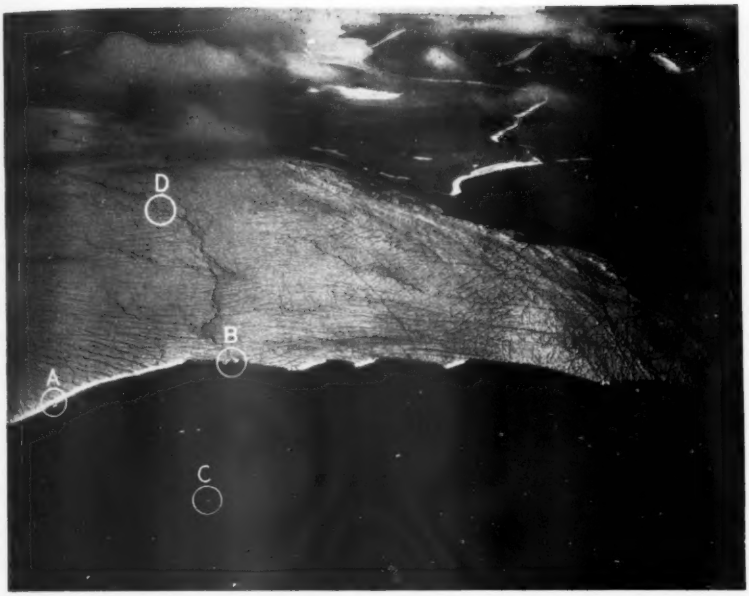
The number of fixed points available for the plotting of the photographs taken in 1924 is inadequate for accurate work, but much may be done by methods of approximation, methods which would be valueless in England, but which are highly valuable in any unsurveyed region such as North-East Land and parts of Spitsbergen. Use is being made of certain points fixed by Nordenskiöld and De Geer, and the general method is to assume the tilt and height, both of which are approximately known, correcting one photograph by means of its overlap on the next, and finally using the isolated fixed points to correct the scale and orientation on the map.

There is a tendency in some quarters to claim too much for air survey. In others it is condemned because it has not yet the accuracy of the Ordnance Survey of England. Its true value lies between. There are few parts of the world where the accuracy of the Ordnance Survey is required. Spitsbergen is not one of them, and the approximate methods referred to will produce a map of considerably greater accuracy than the existing one.

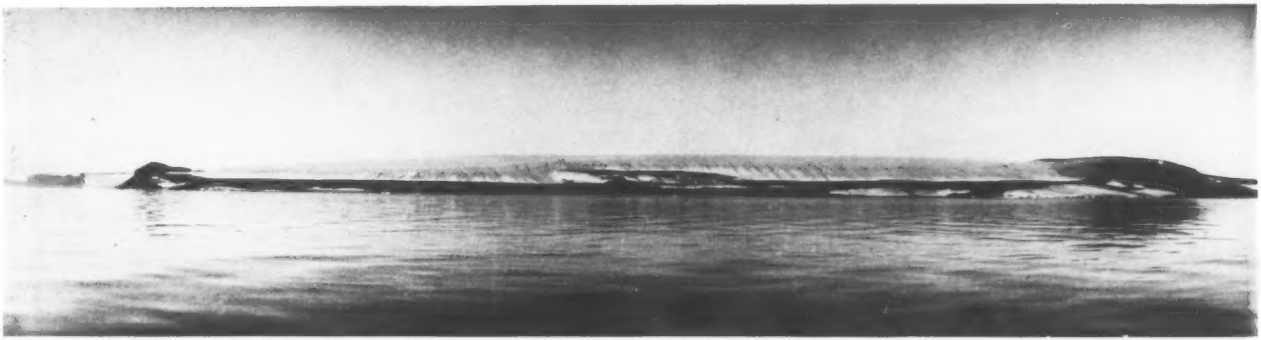
Next to the survey of the coast, the most desirable work in Spitsbergen is hydrographic survey. Mr. Binney in the main paper has mentioned the observation of deep water in Murchison Bay, though this bay is shunned by sealers, because it is supposed to be shoal. Murchison Bay contains a number of islands, and from a height of 3000 feet, in calm weather, every detail of the bottom in the shoal parts surrounding the islands could be distinguished. The appearance of each island can best be described as looking like a pudding on a plate—the plate (shoal water) extending in some cases half a mile or more from the shores of the island, and in some cases coalescing with the plate on which stands the neighbouring island. Almost everywhere at the edge of the plate, the bottom drops away suddenly and becomes invisible. By comparison with the appearance of water whose depth is known, this can with certainty be written down as navigable by all ships which frequent Spitsbergen waters. By this evidence, Murchison Bay is navigable right to its head, by wide channels along the northern side.

In order to survey the bottom of a shallow sea by photography, it is necessary to take overlapping vertical photographs. Very few of the oblique photographs taken show any indication of the depth of the water, and then only where there is a pronounced sandbank just below the surface. By a method analogous to that by which heights may be determined, that is measurement of the displacement from the plate plumb point, approximate bathymetrical lines may be determined from these vertical photographs.

The use of aircraft for this purpose would considerably speed up the hydrographic work which is being carried on in Spitsbergen by the University of Oslo. It must not be thought, however, that the results would be so complete



PAIR OF AIR PHOTOGRAPHS, LADY FRANKLIN BAY, WITH CORRESPONDING POINTS MARKED FOR PLOTTING



HINLOPEN STRAIT, BLACK MOUNTAIN, AND CAPE TORELL, NORTH-EAST LAND

CLARENDON CLIFFS, SOUTHERN SHORE OF WAHLENBERG BAY

or so accurate. The amount of detail which can be seen varies from day to day with the condition of the light and the state of the water surface, and usually in Spitsbergen it was not possible to see the bottom below a certain depth. The presence of much ice would entirely interrupt the method, because of the churning up of the bottom which takes place. For example, it would probably never be possible to use the photographic method in Wahlenberg Bay.

In conclusion of this summary of the air survey methods adopted, it will not be out of place to refer to the methods of operation of the seaplane. The plan originally laid down by Mr. Binney was, with minor modifications, adhered to throughout, *i.e.* to erect the machine at Green Harbour, where certain facilities exist and where the ice clears early, to fly it to the main base at Liefde Bay, which proved an ideal place for the operation of seaplanes, and as opportunity arose or occasion necessitated to operate from an advanced base with one of the ships as seaplane tender. It would be necessary to follow this plan in any future aircraft operations for the survey of North-East Land.

It must be remembered that neither the pilot nor the observer joined the expedition until the organization was complete. The whole of the organization of the air part of the expedition, down to details of camera equipment, was arranged by Binney with the help of Taylor. That it was possible to fly the machine after an engine breakdown and a crash, both of a major character, is sufficient testimony to its thoroughness.

Before the paper the PRESIDENT said: Our lecturer this evening, Mr. Binney, requires little introduction to an audience of this Society. Mr. Binney has been the moving spirit in certainly two, if not three, recent expeditions, under the auspices of Oxford University, to the frozen lands in the neighbourhood of Spitsbergen, Members of the expeditions with which he has been associated have in the past given us accounts of what they have achieved, and Mr. Binney this evening will be able to give us a thrilling account of the experiences of this the most recent and certainly the most ambitious of these three interesting expeditions. The expedition had the advantage of starting under the special patronage of the Vice-Patron of this Society, His Royal Highness the Prince of Wales, and I have little doubt that one of the most treasured possessions of Mr. Binney and his companions is the silver shield which His Royal Highness presented to them as a mark of his interest and good wishes at the commencement of their expedition. The achievements of the last expedition are certainly considerable. For the first time North-East Land has been crossed by a sledging party and many of the technical difficulties of carrying out a survey with the assistance of a seaplane have, to a great extent, been overcome. These achievements have not been arrived at without considerable adventure and, indeed, in the case of Mr. Binney himself, a very near escape from death. But I must not anticipate his narrative by telling you anything of the thrilling experiences through which he passed, particularly when he was marooned on a derelict seaplane. That he will no doubt tell you himself in his own words, and I have much pleasure, therefore, in asking him if he will now be good enough to give us the account of the expedition.

Mr. Binney then read his paper, and Messrs. K. S. Sandford, Captain F. Tymms, and Mr. C. S. Elton gave brief accounts of the various scientific work of the expedition, based on the appendices printed above.

The PRESIDENT: At this late hour I do not propose to invite any further discussion on the subject of this evening's lecture, but merely to congratulate

Mr. Binney and his companions upon their safe return from an expedition which, obviously, consisted of strenuous days, punctuated at times by periods of real hardship. To be marooned in a disabled seaplane for fourteen hours at a time may be an experience to be looked back upon with a certain amount of satisfaction from the safety and comfort of after-days, but which must have been of a nerve-shattering character while actually in progress. Mr. Binney is not only to be congratulated upon having safely returned from such an experience, but also, I think, upon the cheerful temperament which enabled him this evening to make so light of such considerable dangers. It is quite obvious, from the story which has been told us to-night, that much geographical work of real value has been achieved, and I am sure this audience would wish me to convey to Mr. Binney and his companions congratulations upon that success and also good wishes for any future enterprises upon which they might feel disposed to embark.

THE DEAD SEA TO 'AQABA

H. St. J. B. Philby

Read at the Meeting of the Society, 11 *May* 1925.

I COME before you to-night as a substitute for Dr. Rasmussen, whose description of Arctic lands would perhaps have been more appropriate entertainment for a summer's evening than the excursion on which I will ask you to accompany me through what is about this time of the year one of the hottest and dreariest districts in all the world. Curiously enough, however, the reason for which I made the journey I am about to describe was that the more direct route from 'Amman to 'Aqaba over the highlands of Moab and Edom was at the time thought to be too cold for our camels. That was in December 1923, when I held the post of British Representative at the court of H.H. the Amir 'Abdullah, ruler of Trans-Jordan, and I may say at the outset that, wise as we were in the circumstances to elect for the warmer climate of the Rift valley, we were foolish enough to lose our way on the very first day and to find ourselves, thanks to a stupid guide kindly provided by the Palestine gendarmerie, not on the shores of the Dead Sea, but 4000 feet above them in the bleak hills of Bethlehem, where we experienced a period of excruciating cold.

In spite of all, however, I found the journey full of interest from my point of view; but I was somewhat diffident about accepting the Council's invitation to read this paper. It scarcely seemed that there was anything new to be said about a country which was the scene of the Exodus and many other Biblical alarums and excursions familiar enough to an audience of this Society. Many of you have doubtless visited Palestine and even crossed over into Trans-Jordan. If so, you have already at any rate a nodding acquaintance with the country I shall describe, and I can only condone my temerity in describing it on the ground that it is in fact the least-known part of a well-known tract. I do not pretend to have made

an exhaustive study of all the literature there is on this part of the world, but the familiar pages of Baedeker contain an adequate account of the country covered by the northern part of my march from Jericho and Bethlehem to the south end of the Dead Sea. I shall pass over this part very briefly and confine myself to a more detailed account of the Wadi 'Araba district from the south end of the Dead Sea to 'Aqaba.

In December 1923, then, a message was received at 'Amman by wireless from Mecca telling us that King Husain of the Hejaz contemplated paying a visit to his son in Trans-Jordan. The court was all agog with excitement, and, as the king was expected to arrive at any time between Christmas and the New Year, there was little time to be lost. Arrangements were hurriedly made for his suitable reception by escorts and deputations at 'Aqaba and various other places. The 'Aqaba party was to start by the route already indicated on December 21, and, as it was to cover a good deal of country which I had not travelled over, I volunteered to accompany it—thereby not only satisfying my personal inclinations but acquiring considerable merit in the eyes of the Arabs, who regard the courting of avoidable exertion as an unmistakable sign of madness.

Be that as it may, I found myself on the evening of December 21 at our rendezvous under the walls of the reputed tomb of Moses in the foothills between the north-western corner of the Dead Sea and the Jerusalem road. One or two places at the foot of Mount Nebo on the opposite side of the valley contest the claim of Nabi Musa to be the actual last resting-place of the Israelitish leader; but local tradition is satisfied with this more accessible spot, which has the additional merit of recalling a famous incident in the career of Moses to the memory of pious and simple-minded pilgrims. As one approaches, one's olfactory senses are assailed by a pungent odour of burning, and, arriving on the scene, one finds one's dinner being cooked not on burning bushes but on burning stones drawn from the neighbouring hillsides. The explanation is simple enough, for the rock in this neighbourhood is bituminous limestone which burns readily when ignited. Its fuel content is, I believe, not very great —at any rate, not great enough to justify exploitation on a large scale at any considerable distance from a railway; but similar rocks in a part of Wadi Yarmuk, the existing boundary between Syria and Trans-Jordan, have been extensively and successfully used as a cheap substitute for expensive coal both on the Hejaz railway and by the French military garrison at Dar'a.

The cavalcade which had assembled at this place in preparation for the journey to 'Aqaba consisted of about one hundred persons with twice as many animals—camels, horses, and a few mules—to carry them and their paraphernalia. The Amir 'Abdullah had planned to meet his father at Ma'an, whither he could travel in reasonable comfort by the Hejaz railway, and with him he had decided to take the younger of his two sons, Naif, who, though only about nine or ten years old, had already an

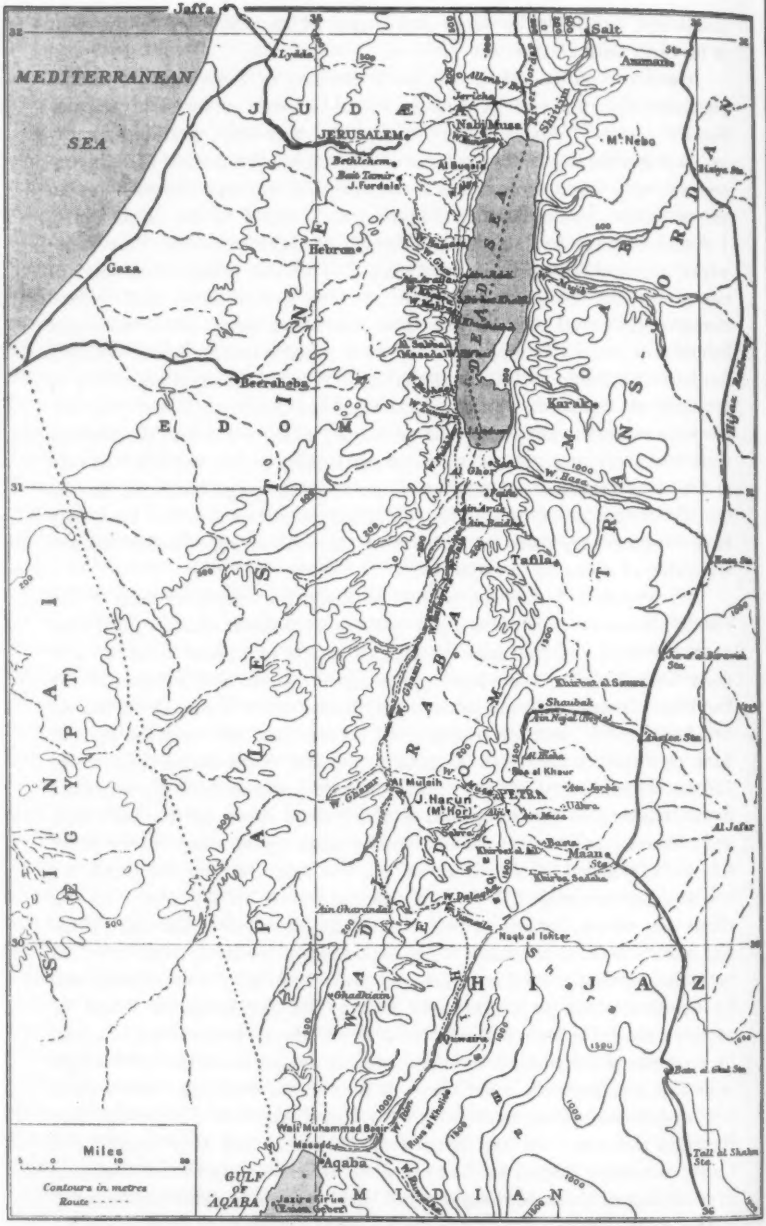
established reputation as a horseman and made no secret of his disgust at not being allowed to go with us. His elder brother, Talal, a lad of about fifteen, was nominally the leader of our party, and as such was always preceded on our marches by the royal standard of the Sharifian dynasty—an honour which he endured with becoming dignity. The effective director of operations was, however, the Amir Shakir, a cousin of the Amir 'Abdullah, a native of Taïf in the mountains above Mecca, and a most delightful person besides being a warrior of some repute. Another distinguished member of the party was Muhammad ibn Rashid of the former ruling house of Haïl, though now a refugee from his own country since its capture in 1921 by the Wahhabis. The rest of the cavalcade consisted of many different elements—Shaikhs from the Karak district of Trans-Jordan, 'Ataiba Badawi from the Arabian deserts, slaves, and what not. And on the whole it was as pleasant a party as one could desire for such an expedition, though perhaps their conversation was too monotonously redolent of the stable for my tastes. Horses and camels were subjects on which they could never tire, and they were almost equally tireless in the matter of warlike reminiscences, with the result that, as they never told the truth when the truth was in the slightest degree discreditable to themselves, one was apt to weary of an endless string of victories on the turf and on the battlefield.

Before I proceed with the description of our journey I would like to introduce two personalities of considerable interest who would not otherwise be able to appear in my narrative. One is the Amir 'Abdullah's eldest brother, 'Ali, who has recently succeeded his father as King of the Hejaz. The other is perhaps the only living claimant to the honour of having seen Napoleon Buonaparte in person. Hajj Tahir, who was one of the many visitors to King Husain during his stay in Trans-Jordan, claimed at this time (spring of 1924) to be approximately 140 years old, having been born at Mecca. He subsequently migrated to Palestine at the age of 12 or 13 in the year 1799, when Napoleon was operating on the Syrian coast. I do not wish to be understood as vouching for the soundness of his claim, but it is locally accepted on the evidence of the oldest inhabitants, who declare that they have never known him as anything but an old man. He is sound enough in wind and limb, and has an enormous appetite and, strangest of all, an indisputable power of mastication with the aid of what purports to be a newly sprouting, but still invisible, third set of teeth. His speech alone, confused and rambling as it is, betrayed the over-maturity of his years, and the only serious weakness in his claim is that his offspring afford no relevant evidence of his age, as he declares that he committed matrimony for the first time at the age of 70 or thereabouts—and he has quite recently married again. In deference to those who may be hypercritical of such a picturesque claim I should perhaps give all the information I possess and add that he dates his birth to the year 1215 of the Muham-

medan era, *i.e.* only 127 lunar years ago, which would make the year of his birth only 1801 A.D.

It was still quite dark in the early morning of December 22 when a premature call to prayer gave us the signal to bestir ourselves in preparation for a start. An excellent riding-camel had been provided for my use, and despite the chilly earliness of the hour, I felt a thrill of exhilaration at being once more, after a considerable interval, mounted on an animal which—without shame I confess it—I prefer to the noble horse. I should perhaps explain, for the benefit of those who were here some weeks ago and heard from Sir Percy Cox of the primitive method of riding—on the crupper—prevalent in 'Oman, that here, and indeed throughout Central Arabia, one rides somewhat more comfortably not behind but on the hump, or rather on a wooden saddle-frame securely fixed on the hump and becushioned with rugs or blankets according to the taste of the rider. In these parts of the Arab world the real discomforts of camel-riding are reserved for the ladies, who—and particularly those who have any pretensions to social elegance—are expected to ride in a sort of fantastic palanquin with protruding wings balanced on the camel's hump and called *Kitabs*. In carriages of this superior kind they have to keep very quiet, which is more than the average Badawi woman is capable of doing on *terra firma*.

A heavy dew during the night had made the clayey surface of the country somewhat treacherous, and our animals slipped about a good deal as we threaded our way past the dim silhouette of Moses' tomb up and down the undulating track leading through the knolls and hillocks of the foothills. Instead of descending towards the coast of the Dead Sea we found ourselves gradually rising until we reached the crest of the left bank of a deep wadi (Wadi Kunaitara) running down eastward from the Judæan hills. Most of us, myself included, dismounted to negotiate more comfortably the steep and slippery slope down to the wadi bed, and remained on our feet for the equally steep zigzag climb up the other side on to a broad plateau between the low ridge skirting the Dead Sea and the higher range (Al Buqai'a) on the west. In the course of this climb one of our loaded camels slipped on the edge of the steep slope and much time and energy were expended in rescuing him from his perilous position. In due course however the valley was cleared, and by common consent it was held that a halt for breakfast would be appropriate. The march across the plateau was enlivened by a fox-hunt by a couple of greyhounds (*Saluqis*) which the Amir Shakir had brought with him, and the only other event of note was the passage far over our heads of the two great machines of the Royal Air Mail proceeding from Baghdad to Cairo. In four hours with reasonable luck they would be at Cairo, 300 miles distant as the crow flies, while we were to find ourselves in twice four hours somewhere short of Bethlehem, only a dozen miles or so away—a striking contrast of ancient and modern methods of locomotion.



Sketch-map of Mr. Philby's Route from the Dead Sea to 'Aqaba.

At the further end of the plateau we struck westwards up another valley (Wadi 'Alya) until we came about midday to the well of Bir Isma'il (in a tributary called Wadi Qurun al Hajar), which we found closed to us by a heavy iron plate duly padlocked. Fortunately there was water in stray pools in the valley-bed, and that circumstance was good-enough excuse for a second halt for more food and a brew of coffee. At this point we began to have doubts as to whether we were on the right track, but there were no guides to be had, and we had to make a virtue of necessity and yield to the insistence of our gendarme that the route up the valley would somehow or other lead us to salvation. It did not, but it was not till we had marched far up the valley (Wadi 'Alya) that we passed through a Badawi encampment of the Ta'amira tribe and learned that in a few minutes we should be in sight of Bethlehem. And so it turned out to be. We now had to fend for ourselves, as our guide shamefacedly confessed to his complete ignorance of the locality. We turned abruptly to the south in the direction of the prominent landmark of Jabal Furdais, whose castle-like summit is connected with the history of the Crusaders. History and all other considerations were, however, forgotten or neglected in the teeth of the chill blasts that swept down upon us from the Bethlehem ridge, and our one concern was to get under shelter as soon as possible. This we did to some extent at a miserable broken-down hamlet called Bait Tamir, perched on a hillock in the midst of the mountain wilderness, and here we decided to spend the night. No sooner had we dismounted and taken up our positions where we intended to sleep, than our more adventurous spirits sallied forth to see what they could get in the hamlet in the way of fuel for our camp fires. A few minutes later I strolled up the hill to examine the settlement, which consisted not of buildings but of mere caves in the hillside round the shrine of a local santon, and its only inhabitants seemed to be a few old men and women who appeared to be in the direst distress. The reason was soon apparent, for a moment later I saw our myrmidons issuing forth from the caves laden with ploughs and other agricultural implements, and in fact everything they could find capable of being consumed by fire. For a single night's warmth (which they could be excused for desiring in the circumstances) they were prepared to burn out the miserable village! I should explain that we were passing through Palestine territory with the permission of the government—in other words, as its guests for the time being; and this was how we proposed to requite its hospitality! I protested, only to be met with incredulous smiles, and it was not till I had hurried down the hill to rouse the Amir Shakir to a sense of his responsibility that the sacking of Bait Tamir was stayed and the looted woodwork restored to its owners. And Shakir, obviously doubting my sanity, made amends to the spirit of hospitality by administering to the ringleader of the plundering party with his own camel-stick as sound a thrashing as could be desired. And then we settled down for a night of the acutest misery, determined,

guide or no guide, to make tracks as rapidly as possible next day for the Dead Sea.

Leaving Jabal Furdais on our left, we marched up hill and down dale for some hours until we struck into the upper reaches of Wadi Hassasa, which we followed downwards. The pace of camel marching in such circumstances is however distinctly limited, and our baggage was too far behind in the late afternoon to permit of any attempt being made to negotiate the precipitous descent of the pass leading down to 'Ain Jiddi by the sea-coast. We accordingly settled down for the night in the broad scrub-covered bed of Wadi Sudair, near the grave of a local saint in a large cemetery of the Rashaïda tribe, an offshoot of the Hutaim of the Hejaz. At an early hour next morning we found ourselves at the head of the pass.

For the first 200 or 300 feet the descent was a narrow zigzag track over a treacherous limestone and flint surface down the face of a sheer precipice, reminding me forcibly of the Saqta pass in the Tuwaiq range of Central Arabia. It was a marvel that all our animals, by dint of cajoling and pushing, leading and pulling, got down this part of the descent without a casualty. Then followed several hundred feet of steep going over a rough surface where falls of the cliff above had formed a sloping platform. It was hard enough on the camels—we were of course all dismounted, even the laziest—but no longer dangerous, though we were glad enough to reach the flattened surface of a bluff about 500 feet above the Dead Sea level, on which the tepid (80° Fahr. according to Baedeker) springs of 'Ain Jiddi well up from the surface amid a riot of vegetation to course down in a slender cascade to the plain below. Near the springs are the ruins of an ancient fort of massive masonry. 'Ain Jiddi is, of course, the Biblical Engeddi.

A rough descent led us down to the delta of Wadi al Ghar, which here issues almost at the Dead Sea level from a deep gorge in a boulder-strewn bed. Through it runs a slender stream of clear cold water, whose source is the spring of 'Ain 'Araija a little way up the gorge. A good deal of alluvial soil is spread out over this delta and is cultivated by the Rashaïda Badawi, whose crops are mainly wheat and barley. The original settlement and seaport of 'Ain Jiddi, which was of more importance in ancient times than now, lies close to the seashore behind a bluff of the mountain cliff which carries the left bank of the wadi to the water's edge. From this point southward the base of the delta runs along the shore for about a mile to a low headland of conglomerate which we rounded on continuing our march to find ourselves hemmed in by rough undercliffs to the beach itself, where the gentle waves of the Dead Sea washed our camels' feet as we passed—much to their annoyance. The distance from cliff to beach from here to the southern extremity of the sea varies from about a mile to less than a quarter-mile, and our march lay either along the beach itself or over the rocky promontories

WADI HAMAIDA DEBOUCHING ON GHOR AS SAFI

WEST COAST OF DEAD SEA, SOUTH OF 'AIN JIDDI

AL BUQAI'A PLATEAU

AL MULAIH RIDGE IN WADI 'ARABA

WADI HASA

TRIBUTARY OF WADI HASA WITH HOT SPRINGS

thrown out at intervals from the mountain barrier on the west or over the numerous spacious deltas of the wadis which at intervals pierce the mountain wall with their deep gorges. In one of the latter, the delta of Wadi Khabra, we passed between the sea and the large elongated salt-lagoon of Birkat Khalil, beyond which we marched over a lumpy surface of clay, whose ups and downs were troublesome to the camels. We then passed into an extensive well-wooded tract formed by the coalescing of the deltas of Wadi Mahras and Wadi Khushaiba, in which our hounds had a good run after three gazelles without success. I also noticed during the day a pair of wild duck of sorts resting on and flying about the Dead Sea.

We camped for the night in the delta of Wadi Hifhaf under the cliffs of the great mountain of As Sabba, on whose summit are the remains of the Roman fortifications of Masada, and the next morning, Christmas Day, we were up betimes to make our way, for some hours by the light of the moon, by a very rough and difficult track over a rocky promontory along the base of the sheer mountain cliff, which here approaches very near to the sea. In Wadi Baghagh we passed the remains of an ancient settlement completely abandoned, and after that our march lay over easy country to the well-wooded delta of Wadi Zuwaira, into which the main caravan-track comes down from Hebron. I did not see any signs of ancient habitations here, but there can be little doubt that this was the site of "Zoar, the city of palm-trees." Close by, along the very edge of the south-western edge of the Dead Sea, lies the long low ridge of Jabal Usdum, the mountain of Sodom, in whose weathered features those who are gifted with imagination can still discern the pillar of salt which was once Lot's wife. The interior of the ridge is apparently a solid block of rock-salt overlain by a considerable thickness of alluvial limestone soil which spreads westward over the wide gap between the Usdum ridge and the eastern face of the Palestine mountain system. The southward track enters a broad bay called Wadi Nukhbar, which leads up to the alluvial barrier and through it by a narrow crack in its surface. On either hand the walls of alluvium towered above us to a height of 100 or 200 feet, weathered into fantastic shapes, and at the further end we rose to the summit, on to which we issued in due course to find ourselves on a vast flat plain but little lower than the summit of Jabal Usdum and betraying but little sign of the track which had brought us up through its midst. In the military maps this tract is marked as "impassable," but it seemed to me that it was certainly practicable for motor traffic, though in wet weather, which is rare in these parts, it would be sticky.

We now descended alongside the course of Wadi Haimar, in which is a salty spring ('Ain Haimar apparently, and not 'Ain al Baidha as shown in the maps) amidst a profusion of reeds and other vegetation, to the low-lying saline tract (*Sabkha*) enveloping the southern extremity of the Dead Sea. We kept with the caravan track along the outer edge of

this marshy area, and, passing several other salty springs, came to camp at the springs of 'Ain 'Arus, from which a slender stream of brackish water runs down towards the sea. The springs themselves are located in the midst of impenetrable thickets of tall reeds, tamarisk bushes, and other scrub, and are backed on the south side by a line of low eminences through which the drainage of Wadi 'Araba makes its way in a many-branched gravelly wadi. A little to the north of us and close to the south-eastern end of the Dead Sea, where the perennial Wadi Hasa runs into it, lay the settlement of Ghor as Safi with its irrigated fields of corn and the black-hair tents and thorn-bush huts of its simple and primitive inhabitants. I had spent a few days among them earlier in the month after visiting the town of Tafila high up in the eastern mountains; it was the first time that a motor-car had ever succeeded in reaching Tafila, and, so far as I know, the experiment has not since been repeated, though there was some talk at the time of converting the precipitous mule-track into a practicable road.

The Ghawarina, as the permanent residents of the Rift Valley both north and south of the Dead Sea are called, are an exceedingly interesting community. Those of Jericho and even the villages of the land of Shittim east of the Jordan have in recent times become sophisticated by frequent contact with tourists and the outside world, with which they are connected by the excellent road from Jerusalem to 'Amman, but here in the south, in the area known as Ghor as Safi and the neighbouring tract of Ghor al Faifa, the community may be studied in its most primitive aspect, and it is difficult to believe that they have changed in the slightest degree since the days of the Exodus—except of course that they have fire-arms like all other Arabian communities, and need to use them on occasion. The predatory Badawi tribes on both sides of Wadi 'Araba (particularly the Sa'diyin of the Beersheba district and the Huwaitat of the east) like nothing better than to descend on them when their crops are green and to give their camels a good free feed. Not content with that, they add insult to injury by claiming the hospitality which no Arab can refuse, and eating their humble hosts out of hearth and home. How such a community can have existed against such odds—for they can only exist by humouring the more powerful Badawi—is a mystery, but the fact that they have existed is proved by their complete racial differentiation from their neighbours. They are in fact not Arabs at all, but a Negroid race, which knows neither how it came to these parts nor whence, and with which the Arabs of course do not intermarry. The Arabs quite freely admit that they could not exist year in, year out, in the appalling climate of what is after all no more than a large hole in the Earth's surface, 1300 feet below sea-level, while the great world, so far as the Ghawarina are concerned, extends no further than Hebron, Jerusalem, and Jericho on one side, and Karak, Tafila, and Petra on the other. Only the most enterprising spirits have seen those great centres of

civilization. So far as I could ascertain none of them had ever seen the sea—excepting, of course, the Dead Sea—and none of them had ever travelled by train, though the local Columbus had once journeyed at a venture eastward from Karak and found the iron track of the Hejaz railway running round the rim of the world. They are fortunate in having at hand in Wadi Hasa a running stream of fresh water, and have evolved a simple system of irrigation, which gives life to about two acres of impenetrable thorn-scrub and reeds to every acre of cultivation. Wild pig are plentiful in these swamp areas, and the luxuriant vegetation of the tract includes a large proportion of tamarisks (*Tarfa*), *Rak*, and thorn bushes. The latter are much used in the construction of zaribas and storehouses for their cattle and grain in a sort of village called Matamir, but for the most part the people live like the Badawi in tents of black hair, which they move about from place to place in deference to the dictates of natural hygiene. At Qasr at Tuba, at the edge of Ghor as Safi along the base of the Tafila mountains, there are masonry remains of the ancients which may or may not be Sodom or Gomorrah. The locality has, I believe, been examined by experts, and I was shown by my hosts a slab of sandstone with a Hebrew inscription dated in the year 434 A.D. The diet of the Ghawarina is simple in the extreme, being almost confined to thin round pancakes of wholemeal bread of excellent quality, onions, clarified butter and milk, with figs and pomegranates, both of which grow here, in the season. Tobacco is their only luxury, and one of which they get so little in the ordinary way that the sexes have evolved a somewhat peculiar method of sharing its delights. The men, needless to say, come off best, for they appear to have the prescriptive right of smoking the precious weed in their clay pipes; these pipes when done with are passed over to the women's apartment, separated from the male quarters only by a flimsy curtain of black cloth, to be cleaned. The ladies of the household proceed with the aid of tooth-picks to extract the juicy nicotine-sodden residue, which is their share of the spoil; they smear it over their gums and between their teeth to ruminate at leisure.

I would like to say a few words about the Dead Sea before proceeding with my journey. Its surface level is, as I have said already, 1300 feet below the sea, and it lies between the steep shoulders of the Moab hills on the east and the Judæan hills on the west. The land-level rises from the Mediterranean to a maximum height of about 3000 feet on the west side of the Rift, to sink abruptly to 1300 feet below sea-level—a total fall of 4300 feet in a maximum of 10 miles—and to soar up again to over 5000 feet above the sea, a rise of 6300 feet. The higher mountains of Edom and Moab tower some 2000 feet above those of Judæa. The latter rise from a comparatively low elevation on the latitude of Beersheba to their highest point at Hebron, whence a steady altitude is maintained to Mount Ebal over Nablus on the north, beyond which the level sinks down to Nazareth, to rise again at Safad before joining the lofty ranges of Syria.

On the east side of the Rift the greatest altitude is reached in the south towards Midian, where the ridge of Mount Seir has an elevation of over 5000 feet above the sea. Thence it drops northward through Tafila and Karak to rise again through Mount Nebo and Salt to Jabal Osha nearly 4000 feet high, beyond which it sinks to the heights of Gadara scarcely 1000 feet above the sea before rising finally to the majestic snows of Hermon.

So much for the lofty neighbours of the Dead Sea. What of the sea itself? I believe I am right in saying that it is too salt for any kind of animal-life to maintain itself therein. Some of you may have bathed in it and experienced the discomfort usually attendant upon such an enterprise, though I must confess that I have only once done so—at the shallow southern end, which is salter than the deeper water of the north coast—and then experienced no after unpleasantness whatever. I hope I am not giving away any secrets when I tell you that "the commercial possibilities of the . . . Dead Sea are enormous." * Its brine is said to be a commodity of infinite economic value, and "within the British Empire there are no known potash deposits of any importance except those in Dead Sea brine." * Unfortunately the authority from which I quote these praises of the Dead Sea does not seem to be aware that it does not in fact lie within the British Empire. Be that as it may, the Dead Sea is estimated to contain "2000 million metric tons of potassium chloride in addition to common salt" * and other commodities, and it only remains to remove it bodily from its present site and place it on the markets of the world at prices not greater than the world is accustomed to pay for potash, salt, etc., for some one to make an enormous fortune. That of course is the problem.

Another problem is rather of scientific than of economic interest. Why is the Dead Sea salt? This problem was discussed by Mr. Wilfred Irwin in a paper published in the *Journal* for June 1923; and while I was in Trans-Jordan I had the good fortune to be able to assist him in his investigation in a very humble sort of way. In other words, I supplied him with a good many gallons of water collected from the various localities I visited while on tour, and on one occasion when returning to England with a case full of bottles I had the greatest difficulty in persuading the Customs authorities that they really contained water and water only. Mr. Irwin would bear me out in this, though he found the quality of the water to vary remarkably from bottle to bottle. With his permission therefore, and indeed with his help—for he has himself put his conclusions into simple language for my benefit—I am able to tell you something of this problem in anticipation of the publication of a paper he is engaged in preparing. The problem, I may say, is not yet solved.

The obvious explanations of the extraordinary salinity of the Dead Sea are apparently not the right ones. It may be that in a former

* Palestine Commercial Bulletin, 21 March 1924.

geological epoch the Gulf of 'Aqaba extended northwards over the present site of the Dead Sea and up the Jordan valley, and that a tilting of the bed of the sea in the south left some of the water, as it were, high and dry in a basin without outlet. Or, again, the Dead Sea being so much below the level of the Mediterranean and only 40 or 50 miles distant in a straight line, it might be thought that the salt water of the latter has reached the former by the process of percolation. In both these cases the difficulty seems to be not only that the salinity of the Dead Sea is about six times as saline as sea-water (24 per cent. of salinity as against 3·8 per cent. in the Mediterranean), but that the salinity of the Dead Sea water and Mediterranean water is of a different quality. In other words about 84 per cent. of the salinity of the Mediterranean is due to sodium chloride, which accounts for only 30 per cent. of the saltiness of the Dead Sea, the remaining 70 per cent. being due to magnesium chloride, whose representation in the salt of the Mediterranean is only 3 per cent.

Mr. Irwin is therefore inclined to reject the idea that seawater plays any direct part in making the Dead Sea salt, and he takes refuge in the apparent paradox that the river Jordan—a freshwater river, be it remembered—is the real culprit. And his analysis of water from the Jordan at the Allenby (Ghoraniya) Bridge has brought out the interesting fact that the river is there from forty to fifty times as strong in chlorine as any average unpolluted stream. He also finds, however, that the proportion of sodium chloride to magnesium chloride is as 4 to 1, whereas in the Dead Sea the proportions are reversed, being as ·7 to 1 as against 9 to 1 in the Mediterranean. The reversing of the Jordan proportions in the Dead Sea he attributes to the sodium chloride crystallizing out on the bottom and at the sides.

If then the Jordan and not the sea is responsible for the salinity of the Dead Sea, where does it get its salt from? A great many of the bottles with which I supplied him enabled Mr. Irwin to eliminate many possible sources of contamination, and the only one with a greater proportion of salts than the Jordan (·151 per cent. of chlorine as against ·04 per cent. in the Jordan) was from a spring called 'Ain Malih on the left bank of the river at a point some distance below the position at which the river samples were collected. My assistance to Mr. Irwin has therefore been of a purely negative order; in other words, I did not succeed in discovering the real source of the Jordan (and therefore Dead Sea) salts. But Mr. Irwin has done so himself in a sample of water received from Tiberias on the Lake of Galilee, which gives the striking proportion of 1·834 per cent. of chlorine, or twelve times more than the spring of 'Ain Malih and about forty times as much as the Jordan itself. He also suspects that there may be other springs in the neighbourhood of similar composition, and hopes in due course to find them.

Finally, Mr. Irwin, on the basis of the ordinary estimate of the Jordan's flow at 6 million tons a day, estimates that about 1 million tons of mixed

salts (sodium and magnesium) find their way annually into the Dead Sea; and, taking the area and depth of the latter at 340 square miles and 400 feet respectively, he reckons that in the 23,700,000,000,000 gallons of its total contents there are 38,500 million tons (in solution or solid at bottom) of sodium chloride and 16,100 million tons of magnesium chloride, which if put together in solid form would make a mountain 4 cubic miles in mass. Assuming that the supply of magnesium chloride from the Jordan was the same in times past as at present, he is inclined to think that the Dead Sea cannot be more than 50,000 years old, which is highly disappointing in view of the enormous figures with which he has dealt.

It is now time to return to our Christmas Day camp at 'Ain 'Arus and to continue the description of our march south of the Wadi 'Araba. Our numbers were now swollen by the arrival from Tafila of the Trans-Jordan camel corps, one hundred strong, and for the rest of the march we had an opportunity of studying the Arab in two aspects—the disciplined troops raised and trained by a British officer, Lieut.-Col. Peake Pasha, and the unruly mob which had so nearly wrecked Bait Tamir and which rollicked along like a herd of schoolboys, always ready for something to eat but otherwise caring not a button for God or man. I must confess that I had never felt convinced that the Arab on a camel could ever be successfully subjected to the routine of military uniform and discipline, but my experience on this occasion made me revise my opinions, as I found that the element of drill and parade routine was not only endured but enjoyed. But it has yet to be proved, I think, that the Arab can be a good fighter in European military formation, for Arab against Arab, I know of no instance in which those imitating European methods have succeeded against the adherents of the old desert school—the Wahhabis, for instance. Witness the Turaba battle of 1919 and the more recent battle of Al Hadda.

On the morning of December 26, headed by the camel corps, we marched for 2 miles in a south-easterly direction along a line of rough limestone hillocks with the reedy marshes of 'Ain 'Arus on our left to 'Ain al Baidha, where a thin stream trickles northward from a group of small springs issuing from the base of the ridge in the midst of dense thickets of rushes. Three miles further on and at a point about as many miles short of the eastern mountain barrier we came to the mouth of Wadi Jaib, a wide valley which here debouches on the Ghor proper, the salty marsh area stretching back from the south end of the Dead Sea.

The soft limestone cliffs on either side rose in sheer walls varying from 50 to 300 feet in height as we proceeded, now in a southerly direction, up the valley over a surface of sandy loam dotted with acacias, tamarisks, and desert scrub. About 4½ miles up we left the southward-trending valley to follow a tributary called Wadi Umm al 'Idan towards the south-west. At first it was not more than 200 yards wide, but it grew broader as we ascended its course to its head (6 miles beyond) in a sort

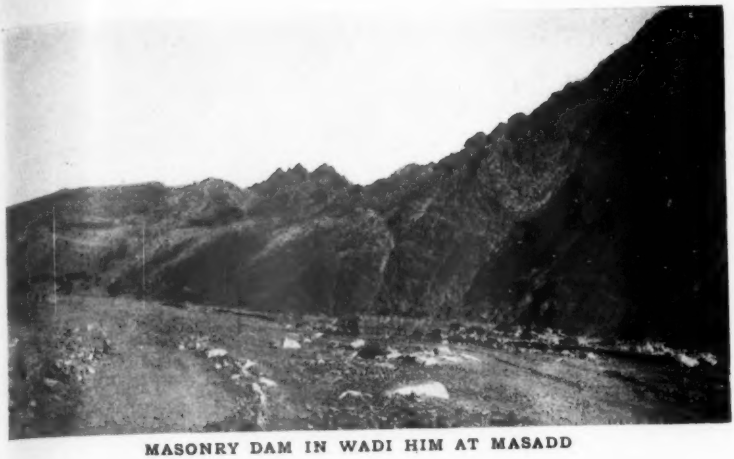
of scrub-covered plateau in which was a spring which gives its name to the valley. We were now about 1150 feet above the Dead Sea, though still some 150 feet below ordinary sea-level, and struck out southward across a vast shingle flat in which after a march of 3 miles we crossed the bed of Wadi Abu Sidr, another tributary of Wadi Jaib. Two miles on we reached the edge of a thickly wooded valley (Wadi Hufaiyira) and crossed it diagonally to a couple of water-holes (*thamaïl*), with brackish but drinkable water at a depth of only 2 feet in the torrent bed, near the right bank of the wadi close under the eastern foothills. Here we found ourselves among the scattered encampments of the Sa'diyin tribe, whose summer quarters lie in the Beersheba district, and who had recently patched up a truce with their traditional enemy, the Bani 'Atiya tribe, resident in the Arabian desert south of Ma'an. Such truces are of course but temporary affairs, but while they last the desert is a pleasant domicile for those who dwell in it, and the casual traveller sees nothing to remind him that the land and all that dwell therein lie under the troublous shadow of an ancient curse. On this occasion, though it was only December, the lambing season was in full swing in these low-lying valleys, and every camp echoed to the bleating of kids and lambs.

Wadi Hufaiyira would seem to be no more than a sectional name of Wadi Ghamr, which would appear to be the main drainage channel of the 'Araba valley northward of the Dead Sea–'Aqaba watershed, which is located at an elevation of about 700 feet above sea-level somewhat to the southward of the latitude of Petra. Wadi Ghamr rises in the foothills on the western edge of the 'Araba valley opposite Petra, and thus drains a part of the uplands of southern Palestine. Thence it strikes diagonally about 15 miles across the 'Araba and, as Wadi Hufaiyira, runs along the foothills of the eastern barrier, collecting the drainage of Mount Seir and the hills of Petra. Thence northward it appears to join Wadi Jaib, and the three separately named sections would appear to form in fact a single channel. It is perhaps unnecessary to say that the amount of water which in any year finds its way down these channels is very small, and is almost confined to occasional floods from the heights of Mount Seir. Whether any of it ever reaches the Dead Sea above ground is very doubtful, and the rainfall in the valley itself and in the arid hills of southern Palestine is very small. The wells or water-pits of Wadi Ghamr, which we passed after a march of about 12 miles from Wadi Hufaiyira, were bone dry, and I was told there had been no rain in the district for two years.

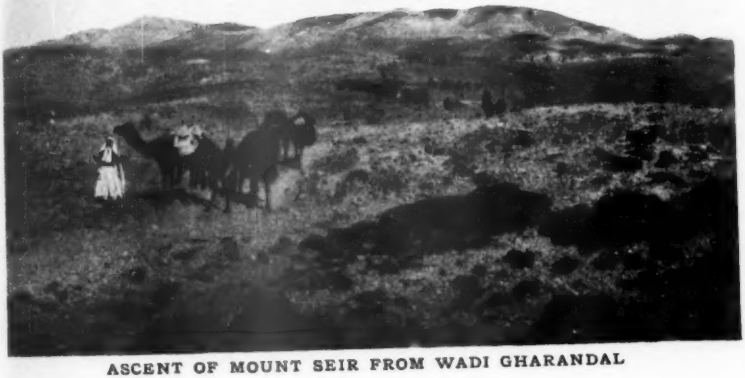
Our march on December 27 lay over a broad valley plain with plentiful vegetation of the usual desert type. Insensibly the low banks on either side increased in height and closed in to form a wadi (Wadi Ghamr properly so called) about half a mile wide with 50-foot banks. Beyond the dry water-pits we left this wadi and proceeded southward over a gravel plain extending apparently unbroken from the western uplands

to the foot of the Petra crags towering up in the distance with their fantastic pinnacles. Our midday camp, at the end of a projecting limestone ridge called Al Mulaih, lay almost due west of Jabal Harun, the highest point in Petra. On the whole this valley country was dull and uninspiring compared with the deep trough in which the Dead Sea lies between its precipitous banks, and the midday haze robbed the highlands of Edom of their glory. I am afraid I have not time to speak of Petra and its surroundings, about which a paper was read before this Society not so long ago by Sir Alexander Kennedy. Through his kindness I am able to show you a few slides prepared from photographs taken obliquely, at his instance, from the air by officers of the Royal Air Force. They illustrate very effectively, I think, the striking contrast between the rugged sandstone crags of Petra itself and the featureless valley of Wadi 'Araba below and beyond them. The difference in level between the valley and Mount Hor (Jabal Harun), for instance, is about 4000 feet, and I would particularly call your attention to a well-marked ridge of red porphyry, which runs through the sandstone of the district and seems to be the northerly extremity of the granitic mountain range of Midian. While on this subject I may perhaps be allowed to say that Sir Alexander Kennedy only discovered the existence of Petra by accident three years ago at a comparatively advanced stage of life. Since then, however, he has thrown himself with such zest into the study of the subject that he has not only revisited the locality thrice in successive years and read all that has ever been written about it, but has made himself one of the leading—if not the leading—British experts on the subject, and has just completed a monumental work on its wonderful rock-carved monuments which will shortly be published. He has thus prepared the ground for the detailed exploration of Petra by excavation of the ruins of a once important city: and excavation alone can reveal the secrets which have lain buried under mounds of rubbish since the city ceased to be inhabited 1400 or 1500 years ago.

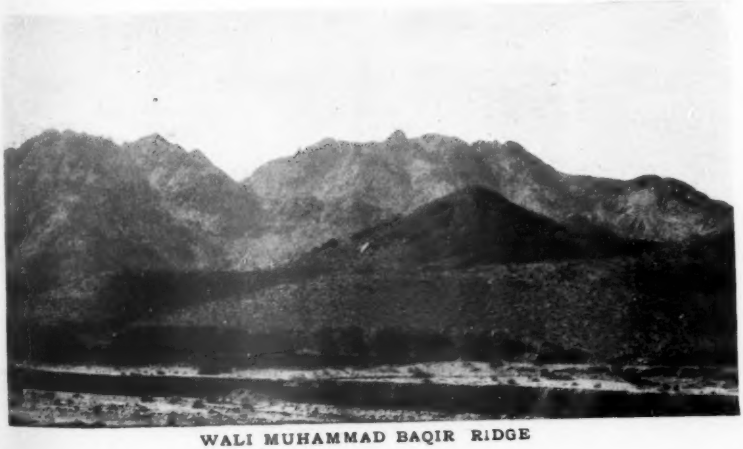
The main difficulty in the way of such further exploration is of a political nature, and, though I have hitherto avoided reference to anything in the nature of politics, I have perhaps been guilty of leading you across a political boundary without signalizing a fact which may in the future add the troublesome necessity for passports to the already formidable array of difficulties with which the innocent traveller in those parts has to contend. The boundaries between Palestine, Trans-Jordan, and the Hejaz are, to tell the truth, somewhat vague, and if you were to ask various authorities the simple question in geography, "In what country is Petra?" you would receive as queer an assortment of answers as any ordinary collection of schoolboy howlers. My own view is that Petra and the surrounding country is in the Hejaz, as all its officials have since the war been appointed and paid by the government at Mecca, which has therefore *de facto* administered the area in question, as it still does.



MASONRY DAM IN WADI HIM AT MASADD



ASCENT OF MOUNT SEIR FROM WADI GHARANDAL



WALI MUHAMMAD BAQIR RIDGE

WIRELESS POST 'AQABA

TALA FRONTIER POST AND 'AQABA

CUSTOMS HOUSE AND FORT, 'AQABA

In the map I have endeavoured to show (with no claim however to infallibility) the *de facto* boundary between the three countries as it has been ever since I have known them at all intimately.* The northern boundary of the Hejaz runs east and west across the Hejaz railway between the stations of 'Anaiza and Juruf ad Darawish, through Khirbat as Samra, a ruined village on the crest of the Edom ridge, and down to the central line of Wadi 'Araba, which it follows southwards to the head of the Gulf of 'Aqaba. Northwards the central line of Wadi 'Araba and the Dead Sea separates Trans-Jordan from Palestine.

The point I wish to make is merely that any one wishing to prosecute the further exploration of Petra, especially by excavation, would do well to secure the good-will of the Hejaz government in advance, and that is not likely ever to be an easy task, partly because it is not quite certain yet who is the Hejaz government, and partly because, whoever it is, it has a feeling that nobody would be so foolish as to dig up tons of rubbish except in the hope of finding hidden treasure under it—and that treasure it would naturally rather have for itself.

For my present purposes I propose to consider that we entered Hejaz territory at about the point at which we turned up southwards out of Wadi Ghamr, and the rest of our march (excluding our camp at Mulaih ridge) will lie wholly in the Hejaz. Southward of our camp at Mulaih ridge we rose gradually on to a wide and featureless undulating plain of shingle stretching across the whole width of Wadi 'Araba—a distance of about 10 miles. Here we appeared to be on the summit of the valley, and the aneroid maintained a steady reading for about 3 miles, after which we entered upon a gradual but steady descent in the direction of 'Aqaba. The watershed is about 700 feet above sea-level, and the easy slope from it southward is varied at intervals by huge mud flats, in which some spasmodic cultivation is carried out by the Badawi on tiny rills led up to the foothills to catch the drainage and direct it in the required direction. These mud flats seemed to be ideal natural aerodromes, and some of them were doubtless used for that purpose during the war when the Royal Flying Corps, as it was called in those days, had a base at 'Aqaba.

By this time, having had no news from 'Amman since we started, we began to fear that our delays had already made us too late to catch King Husain at 'Aqaba. We accordingly decided to strike up into the hills instead of following the valley down to the coast in order to cut into the king's track if he had already arrived and begun the march up to Ma'an. From the mud flats we turned eastward up the sandy slopes on that side of the valley towards a gap in the mountain wall representing the mouth of Wadi Gharandal. Reaching it in due course after a total march of

* The boundary marked by Mr. Philby on the lantern slide shown at the Meeting has not been retained on the sketch-map, p. 138, since the question is at present in a delicate state of discussion. See note following the paper, p. 159.

12 hours during the day we found the narrow entrance of the valley flanked by great walls of rock; that of the right (north) bank consisted of vertical strata about 500 feet in thickness and composed of conglomerate on the outside with flint-banded limestone within, and a thick horizontal bed of conglomerate beyond it, while the left-bank wall was composed of a pinkish friable earth underlying sinuous strata of interbedded flint and chalk, with a mass of the pinkish earth overlying them to a thickness of more than 100 feet. Inside this barrier the valley was composed of deep alluvial deposits of pinkish soil with masses of conglomerate overlying limestone, which gave way at some distance up the valley to a white sandstone foundation—obviously a part of the sandstone tract which runs up from southward of this point to Petra and far beyond.

Just within the entrance a bulge of the valley contains a diminutive oasis with two lonely palms and grassy meadows watered by a slender stream which issues from a spring of sweet water in the midst of reeds. It was a charming little spot, and had apparently last been occupied by the Turks during the war to guard the pass leading up from this valley to the highlands beyond. The remains of their masonry camp buildings were to be seen in every suitable position, while evidence of a much earlier occupation—for more peaceful purposes, perhaps—was provided by an artificial channel for the stream cut in the rocky floor of the valley.

About 6 miles up the valley on our march next day we arrived at a rough and narrow track leading up the sandstone hillside. This we had to negotiate on foot owing to the difficulty of the going, but at the top (about 1200 feet above sea-level) we passed on to the overlying limestone strata which provided us with easier though steeper going. Its distorted and vertical strata, particularly near the summit, which was about 2300 feet above sea-level, and the general character of the valley below, would seem to indicate the occurrence in this locality of an important fault.

On the way we passed a roadside cemetery of the Huwaitat, and noticed on one of the graves (perhaps the grave of a Shaikh) an *'Aqal* or headband curiously reminiscent of the turban-ornaments of the Sultans' graves in Constantinople. Close by also was a water-vessel of wood and scraps of clothing, all of which suggested an elaborate funeral ceremonial which, in my experience at any rate, is unusual among the Arabs. It may well be that the Huwaitat, of whom I have not had much experience at close quarters, are influenced by their known affinities with Sinai and Egypt in the adoption of Turkish burial customs. In other respects they do not differ greatly from the generality of Badawi Arabs, for we had scarcely settled down for our midday camp amid the limestone folds of this projection of Mount Seir when we heard that two stragglers of our party had been held up by some shepherds camped near the cemetery and relieved of two *Abas*, an overcoat, and a rug. The wilder spirits of

our party immediately clamoured for permission to plunder the nearest camp of shepherds in our neighbourhood—every little ravine seemed to have such a camp—but Shakir, with the experience of Bait Tamir fresh in his memory, decided on a more moderate course of action. He sent for the local Shaikh and, detaining him as a hostage, sent his son t o bring in the stolen property when found with the thieves. The latter duly appeared with their booty, and spent some days in the prison at 'Aqaba for their pains.

The jail administration of the Hejaz is primitive in the extreme. I saw the prison of 'Aqaba, which consists of a single square dungeon with very thick walls and no aperture except the doorway, which was usually closed on the occupants by a heavy wooden door. The floor was covered with what looked like stable litter, and its only piece of furniture was a heavy wooden stock, in the holes of which the feet of the prisoners were secured by a padlock. There they lay on the ground until released, and while there they got enough bread and water to keep them alive. It was not a pleasant method of punishment, but one cannot imagine a more powerful deterrent to criminals.

Resuming our march later in the afternoon we entered a valley called Wadi Dalagha, just above the water-hole of Shallala, where the horses of our party were watered. Soon after we turned up a tributary of this valley called Wadi Jumaila, in whose course we passed sections of what looked like a paved Roman road, possibly one of the roads leading southwards from Petra. From the head of this valley we descended along the southward-trending bed of Wadi Thughra, which afforded us a splendid view of the Hisma plain, which we were approaching, with its mountain girdle of sandstone and granite. We camped for the night at the head of Wadi Hilwa (trending westward), just above a spring of the same name, in which is excellent water and which we visited next morning.

By this time the fatigues of a long march were beginning to tell on the party, and the chief victim was the Amir Shakir himself, who had been suffering from a good deal of fever ever since that dreadful night in the mountains of Judæa. He had entirely lost his appetite, but consoled himself for that with tea, which he made himself, putting in about fifty lumps of sugar into an ordinary-sized kettle. That seemed to put life into him, and the process was completed by a course of vigorous massage, at which one of the Karak Shaikhs was an expert. The night being cold, another device was resorted to to prevent a relapse. A space large enough for a man to lie in was scraped out of the sand and a bonfire of brushwood lighted on it. As soon as the fire had died down the ashes were trodden in, and Shakir, rolling himself in a blanket, slept on the still warm sand.

Wadi Hilwa, which provides further evidence of faulting in this region, drains down to a mud flat called Ghadhiain in Wadi 'Araba; but after

watering our camels at the spring, we turned southward up its left bank and, crossing a small wadi called Qanah, reached the edge of the vast plain of Hisma. In its midst near an outcropping ridge of sandstone with steep weather-worn cliffs is the station of Quwaira, on the main track between 'Aqaba and Ma'an. Beside a few ramshackle masonry buildings are the ruins of a considerable square fort, which may date from Roman times, as the place was certainly a station, and probably an important one, on the routes from Petra and Ma'an, which join here, to 'Aqaba. The masonry buildings date from the Great War, when Faisal camped here after capturing the place from the Turks, whose trenches may still be seen.

We now heard for certain that the king had not only not arrived at 'Aqaba, but had gone off at a tangent to visit Madina, and would probably not turn up for at least ten days. Some of us were tempted to turn back and spend this interval in the comparative luxury of Ma'an, but Shakir decided for 'Aqaba, and in the afternoon we resumed our march. To west and south the Hisma plain is bounded by the lofty mountain range of Midian, while on the east rises the ridge of Mount Seir (Shara) over which runs the road to Ma'an up the steep zigzag pass of Naqb al Ishtar, and on the north is the sandstone tract of Petra. The Ma'an–'Aqaba road, whose sandy patches were covered during the war with still surviving strips of rabbit wire, is practicable for motor traffic, and runs south-west from Quwaira to an angle formed by the western and southern mountains, in which is the head of Wadi Itim which leads down through the mountain barrier to 'Aqaba itself.

The width of the valley varies from a mile in its upper reaches to a quarter-mile lower down, and the steep and rugged granite slopes, perforated with striking dykes of porphyry, on either side become more and more magnificent as one descends. At intervals one may still see stretches of the old Roman pavement, which carried the road but is now for the most part covered with deep sand and rocky débris; and here and there are scattered milestones of the same period, no longer upright. Our cavalcade passing down this magnificent avenue of mountain peaks with banners unfurled and drums beating—our numbers had now been increased further by a contingent of the Hejaz camel corps, more picturesque but less disciplined than the Trans-Jordan force—was an imposing spectacle; but the real climax was not reached till the following morning, when, after camping midway in the valley for the night, we resumed our way through the narrow gorge and were met by the 'Aqaba (Hejazi) troops in all their war-paint. The increasing narrowness of the valley and elevation of the mountains added to the splendour of the spectacle, which was still more splendid some ten days later when the whole of the available forces rode up the valley with King Husain, who alternately rode a milk-white stallion of purest Arab pedigree—it now belongs to Ibn Sa'ud—a camel, and lastly a mule, which he preferred to all. At a walking pace it was as fast as any of the other animals.

The most imposing of the granite mountains rising from the valley is known as Wali Muhammad Baqir. On its summit is a shrine sacred to a saint of that name, but it was identified about 1873 by Dr. Charles Beke as the identical spot—he or his companion got to the summit, and ought therefore to know—on which the tables of the law were made over by Jehovah to Moses. Mount Sinai, which is distinctly more accessible to tourists than this imposing but out-of-the-way peak, does not seem to have been seriously shaken by this challenge to its sanctity, and the best that can be said for its Midianitish rival is that Dr. Beke may or may not have been right.

In the valley near the foot of this mountain are several gigantic granite blocks with inscriptions mostly in Kufic characters, of which unfortunately I was unable to get satisfactory photographs. A little lower down and practically at the point where the valley debouches into Wadi 'Araba are numerous evidences of human handiwork, including an enormous masonry dam (Masadd) now largely demolished, which apparently stretched at one time right across the valley, and of which the purpose did not seem to me at all clear. I find however that Sir Richard Burton identifies this as one of the many sites on which the inhabitants of ancient Midian carried out their laborious operations for procuring gold. The gold was apparently brought down by the torrents in their course through the mountains, and the dam was built to hold up the precious water until the golden sand had settled. Then the water was drained off and the gold collected. Unfortunately there seems to be very little evidence to show whether the game was ever worth the candle, though it is highly probable that there is or was gold somewhere in a mountain region which can scarcely be said to have been thoroughly explored.

As we reached the mouth of the wadi there burst upon us a lovely glimpse of the blue waters at the head of the Gulf of 'Aqaba backed by the mountains of Sinai beyond, and as we traversed the undulating gravel surface of the 'Araba slope, the blue grew in dimensions until the whole bosom of the gulf lay before us with the tall palms of 'Aqaba silhouetted against it. The distance from the mouth of Wadi Itim to 'Aqaba is about 6 miles, and our cavalcade was met at intervals in its march over the intervening space by deputations from the village, the last of which was headed by the local governor with a guard of honour provided by the local police and another provided by the local school-children. These formed a wide semicircle, the centre of which was a triumphal arch of palm-fronds over the entrance to the street in which we were to be lodged. Beyond the triumphal arch a milk-white camel was couched with its head securely tied back to prevent its moving. And as Talal, the king's grandson, passed under the arch a jet of blood dyed the ground red at his auspicious feet. The camel was dead but it never stirred, and the same night it was eaten amid scenes of revelry.

'Aqaba itself is perhaps too well known to need much description.

Its situation is picturesque, and some day it may revive the memories of a glorious past when it was Elath at the head of the Ælanitic gulf and the neighbour of Ezion-Geber, the port of Solomon. For the moment it is a miserable little village of roughly constructed huts of granite masonry in the midst of an attractive palm-grove whose owners from time immemorial have been the Huwaitat Badawi. During the war it was occupied as an important base of operations by Faisal's army, to which were attached a flight of the Royal Flying Corps and British supply and technical personnel. The remains of the buildings in which they lived and worked are fast being swallowed up by the sands of time, and perhaps the most pathetic memorial of that hectic period is a monument which will survive for ever. It is a safe of vast dimensions, made of metal and concrete, the temporary home of many thousands of pounds of British gold.

The Gulf of 'Aqaba has been known from ancient times for the peculiar virulence of its storms, and I believe Wellsted, who knew it very well a hundred years ago, predicted that it would never be possible for steamers to negotiate it. That prediction has not been justified by subsequent experience, and the sight of steamers is by no means a rare experience of the villagers of 'Aqaba. But the frailest vessel that ever reached its harbour was surely that which arrived there in the early part of January 1924, with a mixed cargo consisting of camels, horses, sheep, slaves and Arabs, and, last but not least, a king.

During the early part of January the climate was all that could be desired, and bathing in the warm blue waters of the gulf was an unmixed pleasure except for the ever-present possibility of sharks roaming about. But that was a risk which the Arabs could afford to ignore, as sharks are said to refrain from brown skins; the only danger was that they might concentrate their attention on me.

The only building of any interest at 'Aqaba is a picturesque fort dating, according to an inscription on its outer wall, to 1588, when it was built by Sultan Murad, son of Sultan Salim the Second, for the protection of the pilgrim route from Egypt to Mecca, which in those days passed this way. It would seem however, from another elaborate and ornamental Arabic inscription which seems to be in its original position, that some part, if not the whole, of the fort was built during the Mameluke regime, and it may be that Sultan Amurath the Third only restored or rebuilt it, making use of existing material. In the portal of this fort, which is surmounted by a dome on pendentive supports, is the prison to which I have already referred.

Round the fort is a squalid village of hovels built of rough-hewn blocks of granite on the high ground immediately behind the palm groves, which depend on sub-soil fresh water. This water is very near the surface, and can be obtained within a few inches of the edge of the sea by scraping away the sand to a depth of only 6 inches or less.

North of the village is an up-to-date wireless station put up during the war and still functioning very effectively under the supervision of an old Turkish employé, who keeps his machinery in excellent order. Most of it of course comes from Europe, but King Husain's enthusiasm for wireless will be remembered to his credit long after his reign is forgotten, and the workshops of Jidda are actually able to supply the many wireless stations of the Hejaz (Jidda, Medina, Ma'an, 'Aqaba, Yanbu', Qunfida, etc., to say nothing of the ships of the Hejaz fleet) with such spare parts as they require. In the new kingdom of the Hejaz the highest flights of modern science jostle the crudest relics of a distant past more familiar to Abraham than to ourselves.

Before the paper the PRESIDENT said: As a Gold Medallist of this Society our lecturer to-night, Mr. Philby, scarcely requires an introduction to an audience of its members. Suffice it to remind you that since 1915, when Mr. Philby accompanied the Mesopotamian Expeditionary Force as Political Officer, he has made excellent use of the many opportunities which have come his way of exploring Arabia and the adjacent countries, until at the present day there is no one who can speak with greater authority upon the geography of those little-known lands. The journey which he is going to describe to us to-night took him by the Dead Sea to 'Aqaba, and he will no doubt have much to tell us of the curious characteristics of the Dead Sea itself and the country surrounding it. Those of us who have been enjoying the rigours of an English May will probably listen to him a little wistfully when he speaks of a country where he was told when he visited it no rain had fallen for two years. That in itself gives one some idea of the character of the country which he is about to describe to us. He will also have something to say, no doubt, of the characteristics of the people who inhabit it. I will not anticipate what he may wish to tell us either of the country or of its people, but will ask him to give us his story in his own words.

Mr. Philby then read the paper printed above, and a discussion followed.

The PRESIDENT: Sir Gilbert Clayton, Chief Secretary to the Government of Palestine, has just reached this country, and I am sure we should all be delighted if he would say a few words upon the country in the government of which during the past two years he has played so conspicuous a part.

Sir GILBERT CLAYTON: I feel very ill prepared to speak to you this evening, as I only arrived from Palestine on Friday last, and had no previous knowledge of the substance of Mr. Philby's lecture. Lord Ronaldshay mentioned that this audience would probably be looking with wistful eyes towards the country which was being discussed, and I am bound to say that when I sailed up to Plymouth Hoe last Friday I looked with wistful eyes towards the full bath that we should get in England, as in Palestine we are now extraordinarily short of water; almost as short as in the regions which have been described to you.

Mr. Philby has shown us some most excellent views, and has given us a description which I think few but he could give of that country. To those of you who have not seen it I may say that when you do so you will be astonished to remember what an interesting and entertaining lecture Mr. Philby made out of a country which is more desolate than can be described. In the Bible it is variously talked of as "the wilderness," and in some places as the "abomination of desolation"; and in parts it is very like that.

Mr. Philby has touched upon the mineral resources of the Dead Sea, where there is no doubt that very considerable mineral wealth is to be found. Potash, for instance, exists in very large quantities, and it is only a question as to whether that potash can be produced and placed on the market at an economic price. I could not help saying once to an enthusiast on the subject who told me that there were seven thousand million tons of potash in the Dead Sea, that if you took the present price of ice at the Carlton Hotel there was probably a large number of pounds' worth of ice at the North Pole; I do not mean to say that the potash proposition in the Dead Sea is not a hopeful one, but that it is a matter for commercial development and for commercial development only. The potash is there, and it is only a matter of transport and the price at which it could be put on the market.

It is not very easy to say anything more than Mr. Philby has said. For one reason because he is probably the greatest expert on these countries, and for another because there is not very much to say about that part of the country, and he has covered all the ground. He mentioned the fact, however, that all the people go about armed. I should like, from the point of view of the administrator of these countries, to remind you that when all the people are armed it is rather usual to think in England that public security is bad. As a matter of fact, when all the people are armed public security is usually good, because robbery is a very unprofitable trade. When we step into these new countries we are sometimes inclined to take away the arms from the people before we provide anything in the shape of protection from robbers.

I suppose I might be expected to talk on political matters, but I am not going to do that. Mr. Philby did not do so either; but he did mention the question of the boundaries of Trans-Jordan. If I remember aright, he said that if you were to ask all the people who knew anything about it, either inside or outside Whitehall, what the boundaries of Trans-Jordan were, you would get a very varied collection of answers, and he is probably right. He gave us what he considers the boundary, and it was marked on the map that he showed us. All I would say about the boundaries is that no one could accuse them of being either geographical or historical, and if you want to study them I recommend you to ask all those people that Mr. Philby mentioned, get all their views, and then—form your own.

I do not want to detain you any longer at this late hour, so I will merely add that I know something about that country, and I must tell you that Mr. Philby has given an extraordinarily good impression of what it is like, and, short of going there, I do not think those who are interested in it could have done better than come here to-night to listen to him.

Dr. HOGARTH: I accept the President's invitation with considerable reluctance, as I have done once or twice before at these meetings, for the reason that I have no first-hand acquaintance with the region through which the reader of the paper has conducted us to-night. I have seen the two ends of it, as I dare say Sir Gilbert Clayton and many other people have done. I have been to 'Amman. I have come down from 'Amman to the head of the Dead Sea. I have been to 'Aqaba, the objective of the writer of the paper; but not to any places that lie between those two points, or on the main 'Amman–'Aqaba road. By the way, I wondered, when Mr. Philby described the stupidity of the guide who led the party away from the head of the Dead Sea up into the mountains of Bethlehem, whether the latter might have been one of those B. Sakhr or Ajman raiders who so often follow that line.

As for the speculations which Mr. Philby mentioned about the saltness of

the Dead Sea, it had, I confess, never occurred to me that it required such special explanation. The Jordan runs into it, and there you have a river which is extraordinarily salt and foul. The Jewish Jordan and the Holy Well at Mecca, those sacred waters, appear to be among the foulest in the world! The Jordan and its tributaries doubtless drain through many salt-bearing strata on the way to the Dead Sea, which is without outlet; that fact, in a particularly rainless country, had seemed to me sufficient to explain the state of that sea. I dare say that Mr. Irwin is right in saying that the springs of Tiberias are the main source of its salts; but I should like to know what effect they have first on the Lake of Galilee, into which they must go, and as to the saltness of the water of that lake.

I should like to say a word about the Ghawarina, those Negroid inhabitants of the Ghor at the south end of the Dead Sea, about whom we have heard a certain amount this evening. Mr. Philby described them as harmless; but tourists, who have taken that road to Petra and down to the Dead Sea, have been terribly afraid of them. I remember reading of a party of missionaries who went down to Petra and returned that way, and, apparently, were so moved that they fell on their knees at the first sight of Hebron, and gave thanks for their escape from that terrible people. Of course, Mr. Philby's position was a very different one. He was travelling with a large party, and had an escort of a hundred camel corps, and the Amir Shakir, who was, I understand, in charge of the party, was in a very much better position to put the fear of God into the Ghawarina than the missionary party had been. Mr. Philby seems to think that they are an aboriginal Negroid people surviving from very early times; but I distinctly remember (though I cannot recall where) having seen some account of these people as having come to that particular region not so very long ago; that is to say, not longer ago than the Middle Ages, under one of the Mameluke sultans of Egypt. As to their negroid characteristics, it would be interesting to know whence they actually came and to see how far they have become differentiated from their relatives. This extraordinary region, 1300 feet below the sea-level, with its peculiar climate, has probably exercised a very strong modifying effect upon their original characteristics.

In regard to commercial use of the salts in the Dead Sea, neither Sir Gilbert Clayton nor Mr. Philby made it quite clear that the difficulty of using those deposits profitably arises from the fact that the Dead Sea lies in a hole 1300 feet below sea-level; whereas the ground on each side of it rises to something like 3000 feet above sea-level; that is to say, there is a difference of some 4000 feet to be got over.

Mr. Philby spoke hopefully of the excavation of Petra. I have never actually been there, but I have seen all the series of photographs that have been published. There is neither any question of the splendour of Petra as a spectacle, nor any doubt that there are interesting holy places in its neighbourhood; but I deprecate enthusiasm about excavating it. You are off main roads there, and in the presence of a derived civilization—in the presence of a people who used alien arts. I do not think it in the least likely that Petra will yield interesting secrets or great riches to excavation. What I would much rather see excavated are places further north, in the land of Moab, where there was a native art and a native civilization in much earlier days. Personally, I think we must regard Petra, wonderful as it is, as not likely to advance materially our knowledge of ancient civilization.

Finally, I could not help hearing with some amusement how Mr. Philby came to follow King Husain up into the interior of Arabia. Verily time brings its revenges!

The PRESIDENT: There is another gentleman here to-night who has considerable experience of the country that has been described. I refer to Lord Raglan, and I will ask him if he would care to make a few remarks.

Lord RAGLAN: Not long after the Armistice I was appointed British Representative in the Hauran district, which is now bisected by an international boundary. In the first village I visited the shaikh took me aside and said, "I hear that they are going to make Feisal our king. Surely we suffer enough from Badawi without having a Badawi for our king." That, I found, was the invariable attitude of the peasants, and I think you will agree, after hearing Mr. Philby's anecdote of Bait Tamir, that it is not altogether an unreasonable one.

As for the Ghawarina, I agree rather with Dr. Hogarth than with Mr. Philby. I spent a couple of days with the Ghawarina, and it seemed to me that they had neither the platyrrhine noses nor the woolly hair which are characteristic of the Negroid races. If they really were descendants of the people who lived in the Jordan Valley, say two thousand years ago, when the Jordan Valley was in a tolerably civilized state, they would have some remnants of their former civilization; whereas, so far as I know, they have absolutely none. The fact that they do not intermarry with the other Arabs proves nothing. The nomad Arabs and the sedentary Arabs never intermarry, even when, as sometimes is undoubtedly the case, they are of the same stock. It is not perhaps generally realized that the process of transforming nomad Arabs into peasants is continually proceeding. Arabia has always produced more people than it could feed, and one of the outlets has always been Syria. The first thing that happens is that a little cultivation is done in the summer grazing grounds. Stores for grain are made, and hovels are built round them, and the old and sick people remain there during the winter. Gradually houses are built, and people live in them more and more, and the Badawi has become a peasant. Every stage of this process can be seen in Trans-Jordan at the present day, and it is my belief—for reasons into which I will not go now—that most of the inhabitants of Syria and Palestine have gone through this process in the last few centuries.

In regard to what Mr. Philby said about the qualities of the camel Arab as a disciplined soldier, I am rather surprised that Mr. Philby has never heard of the Sudanese Camel Corps. The Badawi is, as he always has been, undisciplined and unreliable as a fighter. The peasants, like most peasants, make excellent soldiers, and the men of Nablus, in particular, had a great reputation in the Turkish Army as soldiers and fighters.

Now I come to a slightly political question, and that is in regard to the Hejaz boundary. I do not know how far I ought to go into that, but one thing I will say, and that is that Ma'an always has been part of Syria, and that the people of Ma'an are Syrians. When I was in Jerusalem once I was in the bazaar, and I saw a number of what were obviously Trans-Jordan peasants, and talked to them, and I found that they came from Wadi Musa, which is near Petra. I do not know whether my friend Mr. Philby thinks that they ought to have been doing their shopping in Mecca.

Though perhaps I ought not to give them, there are a great many reasons why I think the Ma'an should be in Trans-Jordan and not in the Hejaz. Of course, it is perfectly true, as Mr. Philby has said, that the King of the Hejaz has appointed the officials there during the last few years, but that is entirely owing to a private arrangement between himself and his sons, and I do not know why that should be binding upon us or any one else. As a matter of

fact, there are several disadvantages which would accrue if this district were transferred to the Hejaz. In the first place, if Ibn Sa'ud became King of the Hejaz it would be rather a bore to have the Wahhabis at Ma'an. Then there is the question of quarantine. Owing to the quarantine arrangements at the Hejaz ports people contaminated with plague or typhus cannot get out of the Hejaz that way, and the way they would probably select would be through Palestine, which they can easily enter from Ma'an.

As regards 'Aqaba, whether Palestine is or is not of strategic importance to the British Empire is a matter of opinion, but I think there is no doubt that 'Aqaba is more important in that way than any other part of Palestine. A further point is that, as Mr. Philby has mentioned, it is desirable that this most interesting district should be free to archæologists.

Perhaps I might say, in conclusion, that I have never been in the Wadi 'Araba, but I did once see it. I was travelling through the Tafila district, and I spent the night at a village about four hours south of Tafila. On my left, as I stood on a hilltop, were wooded slopes stretching up to the Crusaders' castle of Shobak. About 4000 feet below me was the Wadi 'Araba, and beyond, as far as the eye could see, stretched the hills of Sinai, coloured a brilliant pink in the sunset. It was, I think, the most wonderful view I have ever seen.

The PRESIDENT: I am sure you will wish me to convey to Mr. Philby your gratitude for the paper he has given us this evening. He has told us a certain amount about the boundaries of these countries, and other speakers have made reference to them; but, from the point of view which is of chief interest to this particular audience, we should rather like to have heard what are the geographical advantages of the boundaries which have been mentioned. That, perhaps, has been left a little in the dark. However, perhaps Mr. Philby will tell us at some other time where an ideal geographical boundary between these two countries is to be found.

There was one other small point which Mr. Philby made, and that was the extraordinary admiration and veneration which the people of these countries appear to have for madness. Mr. Philby began his paper by telling us that he acquired considerable credit in the eyes of the people because he had undertaken to take part in a journey which involved unnecessary physical exertion, a thing which, he said, they always regarded as a sign of madness. Why he should have acquired credit in the eyes of the people because they thought he was mad he left unexplained.

Then, again, he told us they had conferred a pashaship upon Sir Alexander Kennedy, as far as I can understand, for the same reason. That, perhaps, is verging on another science, and I will not pursue that instance; but I will join with the other speakers in expressing the gratitude of this audience to Mr. Philby for having, as those speakers put it, made us so admirable a lecture out of what obviously, from a geographical point of view, is somewhat modest material.

NOTE ON THE BOUNDARY BETWEEN TRANS-JORDAN AND THE HEJAZ.

In a written reply to a question in the House of Commons, the Secretary of State for the Colonies said on July 6 that the definition of the frontier of the Trans-Jordan, approved by the League of Nations in September 1922, recognized the town of 'Aqaba, on the Red Sea, as part of that territory. The actual frontiers between Trans-Jordan and the independent Arabian territories of Hejaz and Nejd have never been precisely defined, although his Majesty's Government have at various times invited the Sultan of Nejd and

the King of the Hejaz to agree with them in defining these boundaries. It has more than once been made clear to both parties by His Majesty's Government that they regard the correct frontier as crossing the Hejaz Railway at some point between Ma'an and Tebuk, and as giving Trans-Jordan access to the sea in the neighbourhood of 'Aqaba.

It is true that for some time they acquiesced in the status of the Ma'an and 'Aqaba districts remaining indeterminate pending a final delimitation of the frontier, but when King Husain constituted the Ma'an vilayet a vilayet of the Hejaz, they formally protested, and when it appeared that these districts were being used by the Hejaz authorities as a recruiting ground and also for the transport of war material they considered it their duty, in pursuance of their policy of neutrality, to take steps to establish the control of the Trans-Jordan administration in the area for which they regard themselves as responsible under the mandate.

Steps are now being taken to establish the authority of the Emir 'Abdullah up to the line which his Majesty's Government have always regarded as being the correct boundary of the area under the Mandate for Palestine. The Sultan of Nejd has at the same time been once more invited to co-operate with His Majesty's Government in defining that portion of the frontier which lies between Nejd and Trans-Jordan.

SUDAN SURVEYS

Sudan Survey Department, Annual Report, 1924.— A. A. R. Boyce, O.B.E., Director of Surveys. *Typescript. No price.*

THIS report of the work of the Sudan Survey for 1924 affords an excellent example of the amount and variety of map-making which is needed in an almost undeveloped country, and of the valuable results which can be accomplished for the comparatively small expenditure of £30,000 per annum, but at the same time the very diversity of the work, both in place and kind, impresses the reader with the vast amount of survey which still remains to be done before the mapping of the Anglo-Egyptian Sudan can be considered adequate. At the moment, the filling of blank spaces on the map of the Sudan depends almost entirely on the route traverses sent in by the officers, Administrative and Military, of the Sudan Government, and while Mr. Boyce's fostering care seems to have greatly increased both the number and the excellence of these traverses, it may come as a surprise to many to find how scattered and exiguous is the triangulation framework on which these rough surveys must ultimately be hung. In the south-west there are the excellent triangulations of the Sudan-Congo and Anglo-French Sudan Boundary Commissions, and in the north-east a triangulation along the Sudan-Egyptian Boundary, but to these can only be added some 200 miles of old triangulation from Khartoum southwards along the White Nile. Save for these widely scattered belts, the whole of the million square miles of the Anglo-Egyptian Sudan is untouched by triangulation.

It is true that the Gezira area, south of Khartoum, and that part of the White Nile Province which would come under the influences of the Gebel Aulix Dam have been marked out by beacons into "minute squares," but this system, while admirable for marking positions in these almost featureless regions and well suited to the partially trained workers with whom the technical

staff had to be diluted, gives no adequate check against the accumulation of error over long distances, nor does it afford any easy means of adjusting such errors as are bound to occur.

Outside the above-mentioned areas the primary positions in the Sudan rest on the latitudes and longitudes obtained by the ordinary methods of field astronomy, most excellent and valuable as long as the country remains almost undeveloped, but liable to produce endless confusion as soon as questions of accurate boundaries arise. The Sudan Government, like so many others, demands and obtains maps sufficient for its present purposes without appreciating that, as a country develops, no amount of astronomical or other short-cuts can replace a proper framework of triangulation—completed in bush country by a rigid traverse—and that to delay the preparation of this control until its need is apparent to the layman, involving as it does innumerable adjustments and complications and much resurvey, is no true economy.

The report contains two interesting drawings of triangulation beacons, both of which show the excellent results which can be obtained from the use of even the most unpromising local material. The first is one of the beacons of the Anglo-French Sudan Boundary Commission, while the second forms part of the work of the first Sudanese surveyor to carry out, unassisted by a European, a serious piece of triangulation and detail work.

In order to facilitate the reproduction of maps in Khartoum, the survey has adopted the Douglas method of sun-printing on to zinc plates, which has been employed most successfully in the survey of Egypt for a number of years, and has also purchased a new printing press to replace its old hand-press. These improvements should enable the Survey to produce maps in greatly increased quantity and variety and to stimulate the demand for them.

A significant indication of political changes is that the Sudan Survey has taken over the work of extending and supplementing the levelling for the Makar Dam, Gezira Canalization Scheme and Gebel Aulix Dam, which had been carried out by the Survey of Egypt from 1915 onwards, and has verified the line of precise bench-marks which was established in that year along the newly made railway from Khartoum to Makwar. Considerable changes have been found in the altitudes of bench-marks, but to one who remembers the pessimistic opinions originally advanced that no bench-marks could stand for long in the sun-cracked "cotton soil" of the Gezira, the results obtained after nine years are by no means unsatisfactory.

Screw-piles, some 2 metres and a few 4 metres long, were generally employed, but not unnaturally what few brick houses and lined wells were available were greedily seized on as sites for bench-marks. The second year's work, however, showed that the least reliable bench-marks in the whole area were those placed on houses, and it now appears that those set in lined wells are also unsatisfactory. The use of screw-piles was dictated by the hope that while the piles were anchored by their helices in earth whose condition changed little through the seasons, the upper layers of the soil, expanding and contracting as they were alternately soaked by rain and baked by sun, would pass freely up and down the smooth surface of the pile without disturbing its altitude. Mr. Boyce's report indicates that this hope has been largely realized, for the only type of bench-mark which has come with credit out of his examination is the screw-pile. Even when the individual has proved slightly inconstant, the mean datum of a group of screw-piles has remained unchanged, and it is intended for the future to employ groups of three neighbouring screw-piles as primary bench-marks.

While the technical qualifications of the Sudanese surveyors still leave much to be desired, it is most gratifying to read that Mr. Boyce is engaged on the preparation of a suitable text-book in both English and Arabic. The initiation of this much-needed work, and indeed the whole report, is a most hopeful indication of the development both material and mental which is becoming possible in the Sudan, under the sympathetic care of its British administrators. G. S. L. C.

REVIEWS

EUROPE

Bristol: City, Suburbs, and Countryside.— A. L. Salmon. Bristol: *The Bristol Times and Mirror*. 1922. 7 × 5½, pp. xiv. + 237.

MOST of the forty-odd articles brought together in this volume had already appeared in the *Bristol Times and Mirror*, and the rest in other papers. They are impressionistic or reminiscent notes by a native and lover of Bristol, which at their weakest are pleasant, gossipy articles and in several places rise to real eloquence. For a reader whose personal knowledge of Bristol is slight a map would have been useful; but the precision of a map would hardly be in keeping with the vague poetic charm of many of the impressions recorded. Bristol is one of the most beautifully situated of our larger British cities; in the charm of its immediate neighbourhood it is rivalled only by Edinburgh and Sheffield; and its location in the south-west gives it a marked advantage over both of these rivals in the relative luxuriance of its vegetation. These articles, and the volume which gives them a more permanent form, indicate that the charm of Bristol is appreciated by many of her citizens, and may help to make it known to others. C. B. F.

ASIA

The Heart of Âryâvarta: A Study of the Psychology of Indian Unrest.— The Earl of Ronaldshay, P.C., G.C.S.I., G.C.I.E. London, etc.: Constable & Co. 1925. 9 × 6, pp. 17 + 262.

Lord Ronaldshay has written a book which deserves the gratitude of all who have at heart the real welfare of India. Not least should it be acclaimed, we think, by the people of India: for probably no writer, and surely no administrator, has ever more seriously sought to appreciate the spirit of a people and to discover a point of sympathy even in its less prepossessing manifestations. By calling sustained attention to the underlying ideals and sentiments he takes the sting out of political antagonisms: developments in education, literature, and art receive his generous appreciation; and the central religious and philosophical ideas are as accurately grasped in their essence as eloquently described in their working. He has recognized that the problems of the present day are dominated by a psychological factor, a reassertion, now become explicit, of a specially Hindu mentality in revolt against a crude absorption of Western ideas. Naturally, he is far from approving of chauvinistic extremes, and he gives his admiration to those more candid personalities—there are not a few eminent Indians of that type—whose nationalist sympathies do not cloud their vision of what is worthy of acceptance from outside.

After a prologue largely concerned with Mr. Gandhi, whose attitude is regarded as typically Indian, Lord Ronaldshay devotes some chapters to the progress and outcome of Anglicization in the most definite sphere, that of education. He shows the extraordinary character of the system and traces it

to its real causes (for Macaulay was only a mouthpiece of missionary views formulated long before, and practically he brought his well-known Minute out with him)—there was no *career* in business or in government service for Indians of high attainment in their own literature and sciences. As a pendant, we have chapters dealing with the creation of the modern Bengali language and with the old logical schools of Nuddea, which the author himself visited with great *éclat*. It is one of the deplorable facts in history that two really sane and far-seeing endeavours of Orientalists, Hodgson's advocacy of the vernaculars and Dr. Ballantyne's efforts to provide them with a scientific terminology through the medium of Sanskrit and Arabic—enterprises which have had to be renewed in recent times—were put out of court by the hard illogic of circumstances.

Lord Ronaldshay next discusses the influence of Keshub Chunder Sen, which in spirit was largely Hindu; and so we come to the accounts of designedly Hindu institutions, such as the Academy at Daulatpur and the Haridvar Gurukul. From this point, *viâ* the anarchist movement amongst students and its idealist background, we pass on to the consideration of wider matters, the patriotic influence of Bankim Chandra's novels, the Bhagavadgītā, the modern art, and the part played by sex-symbolism in Indian religion.

The argument culminates in an examination of Indian monism and the Vedānta in its older and its modern developments (Chaitanya, Rāma-Krishna). It is in a religious aspect that the Vedānta (the internal logic of which is delicately probed) is of actual and indeed fundamental importance. This is, accordingly, the point at which it divests itself of a philosophical character and becomes a matter of religious history and psychology, a definite mental infusion, which tinctures even the experiments and speculations of scientists of acknowledged eminence.

To Lord Ronaldshay's diagnosis we cordially subscribe, and we would further add that the mentality which he describes is entitled, in so far as it is sincere, to exist, and may justify its existence by verifiable illuminations of natural facts. We would only take note of two qualifications, the first being that Lord Ronaldshay's exposition applies specially (as he clearly recognizes) to Bengal, and the second that in a country which during about seven hundred years has been mostly under the rule of foreign authorities and ideas the intellectual attitude must inevitably display an over-"spiritual" tendency. In pre-Islamic India the psychology was far less "unanimous"; and Rajputana and the Panjab, not to mention Bombay and Madras, have a full claim to represent a true line of descent.

In an Epilogue Lord Ronaldshay illustrates from the case of Mysore the possibility that in the political and constitutional sphere the old-established precedents of the West may undergo interesting developments in their Indian acclimatization.

F. W. T.

The Walls and Gates of Pekin.— Oswald Sirén, Ph.D. London: John Lane. 1924. 13 × 10½, pp. xviii. + 240. *Maps and Illustrations*. £6 6*s*.

The opening paragraph of its Preface gives concisely the *raison d'être* of this portly and handsome volume. "The origin of this book," it says, "is the beauty of the city gates of Peking; their importance as characteristic elements in some of the finest views of the Chinese capital; their wonderful setting amidst old buildings, fresh trees, and decaying moats; their decorative character. Some of these gates may still be called landmarks of Peking, historically as well as topographically; they reflect, together with the adjoining

walls, much of the early history of this great city, and they form, together with the streets and landscapes in which they are set, the most relevant spots of characteristic and beautiful scenery."

In his last words the author exclaims, "How long will they still remain, these wonderful walls and gates?" Modern buildings, he tells us, are increasing. Many of the old streets are being widened and their gay carved shop fronts destroyed; much of the magnificent red wall round the Imperial City has been torn down to make room for tram-cars. Peking is no longer the capital of an empire but of a distracted republic, which cares little for the old palaces of its emperors and the temples of its gods.

Dr. Sirén obviously comes forward none too soon to give the world a substantial record of what Peking has been. He has done his work very thoroughly, both from the historical, the antiquarian, and the architectural points of view; and he is far from neglecting the artistic aspects of this great and unique city. No place is so full of pictures for the artist. The mark that distinguishes at the first glance China from Japan is that in the former no one thinks of repairs. The beauty of the country and its buildings is of the past; of a neglect that seems universal; grandeur and squalor, streets and gardens, fields and ponds, are mixed up without any attempt at congruity within the circuit of the walls—walls in the case of Peking which exceed all the travellers' anticipations. And the majestic gates, with their double doorways and towers, and painted and canopied guardhouses, are on an equal scale.

Dr. Sirén has been at great pains to collect a mass of original information from Chinese volumes, as well as from study of the buildings themselves and their tablets and inscriptions. His work is illustrated by a number of architectural drawings and elevations, as well as by over two hundred fine photogravures. It is a monumental volume; worthy of the monuments it records, and whose memory it should serve to perpetuate. It contains much that must interest the general traveller and student of China, as well as those for whom it has been with so much industry and perseverance designed. D. W. F.

AMERICA

North America: An Historical, Economic and Regional Geography.—Ll. Rodwell Jones and P. W. Bryan. London: Methuen. 1924. 9 × 5½, pp. xiv. + 538. *Sketch-maps.* 21*s. net.*

This work is a group of studies of most of the chief geographical aspects of North America rather than a systematic treatise. The historical section deals fully with the geographical conditions which influenced the discovery and the colonial settlements of the Spanish, French, and English, and their conflicts down to 1763 A.D. The statement of the geographical differences, and resulting contrast in economic and social development, between the New England and Virginia colonies has seldom been made so clearly as here. For later events it is very brief; and the absence of any connected account of the westward spread of population since the middle of last century is perhaps the chief omission of the book.

In the economic section Dr. Bryan has given a clear account of the geographical factors affecting the supply and movement of the major products; and his chapters on Cotton and Coal form valuable additions to the literature of the subject, though his too brief statement (p. 173) of the response of cotton to the application of fertilizers needs qualification, and we would have welcomed further discussion of the problem of intensive cultivation of cotton.

In the regional section Mr. Rodwell Jones gives equally useful and finished

studies of New England, California, Mexico and the Prairie Provinces of Canada. In the Preface (p. vi.) the authors state that ". . . the complete division . . . into regions seems to us rather an interesting exercise than a useful basis. . . ." This will always be a question of degree, and opinions will differ as to how far such a division should be carried in any particular case. But a comparison of the excellent regional studies just mentioned with the scattering of the matter relating to the Central Lowland is interesting. The physical geography of the latter is partly treated in chapter iii., which deals with the evolution of the Great Lakes and the waterways and portages, partly in chapter xxiii., and partly in the chapters on Wheat, Maize, Iron, and other Resources. The result is that the reader obtains a much clearer mental picture of the first-mentioned regions than of the Central Lowland. Strategic conditions enter very little into this work; but the authors' difficulty in seeing a justification for the railway to Key West (p. 425) might be solved by noting that Key West was a prominent advanced base for the U.S. Navy in the Spanish-American War.

Many writers on North America give the impression that they regard it as consisting of the U.S.A. plus some other relatively insignificant countries This attitude is perhaps partly due to our lack of any convenient brief terms to denote the U.S.A. and its citizens, and the resulting tendency to use "America" and "Americans" in this limited sense. In population and wealth the U.S.A. is so much the chief division of North America, and even of the Americas taken together, that the implied claim to monopolize the term is readily understandable; often it can only be avoided by a more or less clumsy periphrasis, while every other country of the Americas has a simple name. Parts of this book indicate that the authors have not completely avoided this error, though it is less prominent than in many geographical treatises written in the U.S.A. Yet many of the "general" diagrams refer only to the U.S., *e.g.* the Frontispiece, showing physiographic regions, and the climatic diagrams forming Figs. 24, 30, 31, and 32, all of which would be more valuable if they were extended to include those parts of Canada and Mexico for which data are available.

The numerous and generally very clear diagrams are a valuable feature of the book. Many of them would be even more useful if they included some indication of latitude, which is often and rightly stressed in the relevant text, and scales. Fig. 6 also needs orientation. Some diagrams use the state boundaries as a convenient net of reference lines; but the net is incomplete on several of these, *e.g.* Fig. 24 omits eight such boundaries. On p. 99 there are two references to Louisberg, of which the first appears to be a mistake for Louisburg (N.C.) and the second for Louisville (Ken.). These are instances of minor blemishes on a book which is probably the best single-volume geographical work on North America which has yet appeared. C. B. F.

Per Lindeströms Resa till Nya Sverige, 1653–1656. Skildrad av honom själv i hans handskrift 'Geographia Americæ eller Indiæ Occidentalis Beskrijffningh.'— Utgiven av **Nils Jacobsson.** Stockholm: Wahlström & Widstrand. 1923. 9 × 6, pp. 200. 27 *Illustrations and* 3 *Maps. Price* 4.75 *Kr.*

Students of the early history of Pennsylvania have become so familiar, at second hand, with Lindeström's 'Geographia Americæ,' that they are sure to welcome this, the first, appearance of the work in print. Mr. Jacobsson has produced a popular edition, with a useful introduction and many well-chosen illustrations, including those by the author. He has changed the title, which was admittedly misleading, and summarized some of the rather diffuse sections

in the latter part of the work. Notes he has eschewed ; indeed, a full apparatus of notes to the 'Geographia' would be as long as the work itself.

Lindeström was a military engineer, who was sent out with the tenth expedition to New Sweden to survey the colony. The 'Geographia,' the result of his visit and experiences, was written in 1691, long after the colony had ceased to be a Swedish possession. The manuscript, which was kept in the Royal Archives at Stockholm, has been consulted by many writers on the early history of the eastern States of America. T. Campanius Holm quoted very freely from it in his ambitious 'Kort Beskrifning om Provincien Nya Swerige uti America' (1702). Recently Mr. Amandus Johnson has embodied everything in it that was of importance to students of American history and geography in his great book 'The Swedish Settlements on the Delaware . . . 1638–1664' (University of Pennsylvania, 1911).

The chief interest of this publication is now, therefore, that of a seventeenth-century traveller's tale. Little more than half the book is taken up by the report on New Sweden and the narrative of events leading up to the "annexation" of the colony by the Dutch in 1655 ; the rest describes the outward voyage of Lindeström's ship, the *Eagle*, and the author's adventures in Germany on his way home. His stories of a murderous barber at Calais, of English hospitality at Weymouth, Catholic ceremonies and intrigues on the Canaries, sharks and purgative nuts at St. Kitts, and of the wicked German noble who robbed him at Wismar, make excellent reading, all the more so because Lindeström has an artless style and little sense of humour. Though a prominent government official and a stout Lutheran, he shows, in some ways, a credulity almost mediæval. He tells us that Dover Castle and several other English castles were completely given over to Satan and his devils ; that sirens appeared and sang round his ship in the Atlantic, luring many to a watery grave; and that at St. Kitts he was pursued by the devil in the shape of a monstrous animal.

Both for its human interest and as an excellent introduction to the history of a little-known colony in America the book is eminently worth reading. We understand that an English edition, with notes, will be published in England and America. E. W. L.

AUSTRALASIA AND PACIFIC ISLANDS

The Vegetation of New Zealand.— L. Cockayne. (*Die Vegetation der Erde*—Sammlung pflanzengeographischer Monographien, XIV.) Leipzig: Engelmann ; New York: Stechert. 1921. 10 × 7, pp. xxii. + 364. *Two Maps, 95 photographs, partly in 65 plates and partly in the text.*

Dr. Leonard Cockayne is well known as one of the ablest, most enthusiastic, and most successful workers at the problems of plant distribution and ecology in the whole extent of the British Empire. During the past thirty years he and his pupils have built up a knowledge of the New Zealand flora and vegetation which for interest and variety equals, if it does not excel, that of the best-worked regions of the world. In the book under review—the only contribution to the well-known *Die Vegetation der Erde* made by a British subject—he summarizes the knowledge so acquired.

The introduction deals with the history and literature of our knowledge of New Zealand plants. Part I. is devoted to a sketch of the physical geography and climate of New Zealand, Part II. (250 pages) to the vegetation of primitive New Zealand, Part III. to the flora and its distribution, and Part IV. to a short account of the history of the flora from the Jurassic period to the

present time. The vegetation is dealt with in five main sections, the sea-coast, the lowlands and lower hills, the high mountains, the outlying islands, and finally the effect of settlement on the plant covering of New Zealand (with a concluding chapter of six pages on agriculture and horticulture). Within each of the first three sections the first chapter contains general observations on the vegetation, the second a description of the leading physiognomic plants and their growth forms, the third of their "biology," the fourth a systematic description of the plant communities. A notable feature is the statistical data of the occurrence of certain characters, such as the height, thickness of trunk, and habit of the trees, the length and consistency of the leaves of the species belonging to the various communities.

It would be impossible in a short notice to describe or comment upon the detailed information with which a concise, systematically arranged book like this is packed. We need only say that the author has admirably carried out his laborious task. It may be noted that Dr. Cockayne is at pains to contradict flatly one widespread impression with regard to the New Zealand flora, and the passage is worth quoting in full.

"It is frequently asserted in scientific writings that New Zealand indigenous plants are less fitted for their environment than many of the introduced species, and that, in consequence, these latter readily displace and replace the former when they come into competition. This is a long way from the actual truth. . . . Wherever any part of New Zealand is in its primitive condition and uninterfered with by man or the animals he has introduced, none of the exotics have gained a foothold, their great powers of dissemination notwithstanding, although the virgin area may be pierced in all directions by ground occupied by man where there are introduced species in plenty" (p. 283). It is only where man has interfered by fire, draining, cultivation, or introduced animals that the vegetation has been changed. In such places new conditions are created and new plant communities arise, made up sometimes of purely exotic species, sometimes by mixture of these with native species. These authoritative statements should eradicate the erroneous notions on this subject that have taken root.

A. G. T.

Green Islands in Glittering Seas.— W. Lavallin Puxley. London: George Allen & Unwin, Ltd. 1925. 8½ × 5½, pp. 316. *Illustrations.* 12*s.* 6*d. net.*

Books dealing with the South Sea Islands continue to pour from the Press, and a reviewer might well feel that Mr. Lavallin Puxley is courageous in adding to their number when he reads in the foreword of this book that "the following jottings do not pretend to tell much that is new." Happily, Mr. Puxley is unnecessarily modest. It is true that his book makes no contribution to geography and little to ethnography or anthropology, since most of the information he gives regarding the inhabitants of the "lesser known islands of the Pacific" is too general and too fragmentary to be of any permanent value. Moreover, it was hardly necessary to re-tell the oft-told tale of the mutineers of the *Bounty*. On the other hand, when he comes to the subject of the natural history of these seas and islands he has much to say that will be new to many of his readers, and much that makes fascinating reading. A man writes best of what he loves best, and, as Mr. Puxley showed us in his earlier book, 'Wanderings in the Queensland Bush,' he is a lover of all living things. His chapter on birds of paradise is intensely interesting, and besides describing some of the strangest members of this radiant family he shows the good results that are being obtained from the measures taken to protect these glorious birds. Another valuable chapter is that describing

peculiar forms of life that have been found developed in certain islands, as, for example, the Kagu (*Rhinochetus jubatus*), a rare grey bird the size of a hen, with speckled feathers and a grey crest, that is found in the dense forests of the Blue River district of New Caledonia and nowhere else on Earth. It barks like a dog and is hunted with dogs for the sake of its flesh, for although it has wings it never uses them. Mr. Puxley has some good notes on the shark and its relations, and describes many "queer fish," the most amazing of all being, in his opinion, the fire-fish (*Pterois volitans*); its chief tone is a brilliant scarlet, while from its jaws hang long filaments finished off with scarlet tassels.

Mr. Puxley's illustrations, though technically good, are commonplace, and it is a pity he could not have included pictures of more of the strange creatures he describes. The book itself is well produced, but it seems extraordinary that the publishers should issue a volume of this kind without an index—an omission which destroys much of its value as a work of reference. O. R.

POLAR REGIONS

Report of the Scientific Results of the Norwegian Expedition to Novaya Zemlya, 1921. Edited by **O. Holtedahl.** Vol. I. Oslo: Videnskaps-selskapet i Kristiania. 11 × 7. 1924. *Maps and Illustrations.*

In spite of relative proximity and ease of access, at least to the west coast, Novaya Zemlya is still imperfectly explored. In the tenth century, or even earlier, Norwegian and Russian hunters probably visited its shores, but not until the sixteenth century was it revealed to the west of Europe by Burrough, Barents, and others. Russians surveyed its coasts in the eighteenth century, and revised the surveys about a hundred years ago, but there was no scientific exploration till 1837, and most work of that nature is much more recent. Dr. Holtedahl's small summer expedition found a wide field for research. His main aim was geological work, but the present volume, which we presume is to be followed by at least one other, is devoted principally to zoology and botany, including a short paper on the birds by Mr. H. T. L. Schaanning, and a long account of the vascular plants by Dr. B. Lynge. The latter records 155 of the 189 species known, but unfortunately does not include a general discussion of the geographical distribution and origin of the flora, and pays little attention to the general nature of the vegetation and plant associations. The expedition spent two months in Novaya Zemlya, visiting the whole of the west coast between Goose Land and Pankratyev Peninsula, and traversed Matotchkin Shar. A crossing was made of the north island from Mashigin fjord to Zivolka fjord (see *Geographical Journal*, May 1922).

The most important geographical sections of the present volume are the chapters on the Quaternary geology, by Mr. O. T. Grønlie, and the maps by Mr. B. Dietrichson. The latter include a revised small-scale map of the coasts of Novaya Zemlya, a sketch-map of Serebryanka fjord and Matotchkin Shar (1 : 250,000) with several corrections and additions, and a new map of Mashigin fjord (1 : 100,000). After giving details of his studies of recent geology of the country, Mr. Grønlie summarizes our knowledge on the subject. As a branch of the Ural Range, Novaya Zemlya is the remnant of a Permian fold with a central zone of Upper Cambrian and Devonian rocks, bordered on the east and west by Carboniferous or Permo-Carboniferous strata. Along the west, and probably also in places along the east coast, is a coastal plain similar to the Norwegian strand-flat, averaging 100 metres in height, and

facing the sea in a vertical cliff. The Permo-Carboniferous strata of this strand-flat have a steep and even vertical dip, and are overlain by moraine matter. In places the plain has been partially demolished by wave and ice action, and in the north is much intersected by bays and fjords. From the strand-flat the ground rises, as a rule rather abruptly, to a plateau of 250 to 600 metres, cut by ice-worn valleys or river ravines. This plateau appears to be the most usual land-form between the fjords. Numerous transverse valleys, of which Matotchkin Shar is the most notable, cut through the central range. "They must have been started and deeply cut down by river action long before Quaternary times. During the Ice Age they have been widened and deepened to the present form." The south island has a few valley glaciers near its northern end; the north island, south of lat. 75° N., is covered with a network of valley glaciers, but the strand-flat is almost free from ice. North of lat. 75° N. "a regular inland ice" covers the island, including most of the strand-flat. The peaks in the north now stand forth as nunataks. Mr. Grønlie says that the glacier streams are small and are not largely supplied by water from under the ice. Nevertheless they must be very active in spring and on warm days in summer, because of the large deltaic plains built along the coast. Space does not permit a full account of Mr. Grønlie's valuable account of the probable changes in Novaya Zemlya in glacial and post-glacial times. He compares the strands with those of Spitsbergen, Greenland, etc., and finds a close correspondence, the highest strand in Novaya Zemlya being about 400 metres, in Spitsbergen about 540 metres, and in Franz Josef Land about 333 metres above sea-level. At maximum depression the thickness of the ice-sheet, which extended far into the Barents Sea, was at least 700–1000 metres. Mr. Grønlie agrees with Dr. Nansen that the strand-flat "has been developed during interglacial periods with cold climates, especially during the very cold time preceding each glacial period . . . as long as the level of the shore-line remained nearly stable." The land seems to be stationary or slowly rising now, for the present shore-line is better marked than any of former times.

The volume is produced at the expense of the Government Scientific Exploration Fund, which also bore the cost of the expedition.

R. N. R. B.

MATHEMATICAL AND PHYSICAL GEOGRAPHY

The Military Uses of Astronomy.— F. C. Molesworth. With a Foreword by **General Sir W. R. Birdwood, Bart., G.C.B.**, etc. London: Longmans, Green & Co. 1924. 8½ × 5½, pp. ix. + 112. *Diagrams.*

The author of this short treatise (which is somewhat similar in scope to the late Bertram Stewart's 'Active Service Pocket-Book') has shown undoubted courage in discussing in a very popular manner a subject which is erroneously considered by many to be a preserve of the highly trained specialist. In the short compass of some hundred pages he leads us from definitions through the relative motions within and without the solar system to definite conclusions, to wit, approximate methods of discovering directions and time by the sun and the stars, and the circumstances of the tides and the moon. Incidentally several popular fallacies are laid low, and certain matter extraneous to the points at issue is touched with sufficient skill to produce an incentive to further study of the subject.

The section dealing with time embraces a very wide field, and though simple minds may find the reasonings difficult of appreciation, the author

makes his points with decision and summarizes them in clear-cut rules of thumb illustrated by copious examples. The interdependence of zone, summer, and local times is ably discussed, as is also an ingenious method of treating the north and south heavens as clock faces, and deducing local time by the combination of observation with the unaided eye and a little mental arithmetic. Direction is made chiefly dependent on that of the sun, which in its turn is deducible from a series of charts prepared for definite latitudes and entered with date and time as arguments. The method is to be considered as replacing the use of the compass when the latter is absent or out of action owing to local attraction. A pretty graphical method of obtaining the bearing of the sun or moon at time of rising or setting is also included.

The circumstances of the moon are discussed in a short chapter culminating in rules for calculating its approximate age and times of rising and setting. The phenomenon of tides is treated very popularly, but here again rough-and-ready rules are given for the calculation of times of high and low water following a short period of observation.

In addition to the more important matter described above, valuable hints are given on the construction of sun-dials and sun-compasses, and methods of obtaining rough angular measures by means of dimensions of the hand. Although arranged primarily for the use of the soldier, this little book should prove of distinct interest and practical value to the civilian. The style is easy and gives the impression that the author is really anxious to help.

L. N. K.

Rivers and Lakes: The Story of their Development.— Martin A. C. Hinton. London: The Sheldon Press. 1924. $7\frac{1}{2} \times 5$, pp. x. + 182. *Illustrations.* 6*s. net.*

The unscientific reader will find no better introduction to the study of rivers than Mr. Hinton's book. Few technical terms are used, and they are always carefully explained. It is true that in the opening chapter Mr. Hinton speaks in an offhand way of oxygen and hydrogen, but nowadays even the classically educated reader has heard of them; and if he has forgotten he need not be deterred from proceeding further, for the greater part of the book will still be intelligible. The author, indeed, has kept a watchful eye upon his words, and has been very successful in avoiding the intrusion of terms which belong to the everyday language of geologists, but not of other people. It is not possible, however, to deal with the development of English rivers without using the names of the geological systems. The author has done his best, and these names are not introduced until the fourth chapter. It may be hoped that by that time the interest of the subject and the attractiveness of the author's exposition may induce the reader to pay proper attention to the necessarily brief explanation of these terms. Since the author is so careful in such matters, it is perhaps worth while to draw his attention to the fact that he uses the word Tertiary in his third chapter.

Although the book has been written primarily for those unacquainted with geology, some sections will be useful to those who have more than a smattering of that subject. The Thames is the principal example throughout, and the more advanced student, omitting the elementary portions, may look upon the book as a convenient summary of the history of that river. But he should bear in mind that discussion is not possible in a work of this nature, and geologists are not in agreement on all points.

The general scheme of the book is well adapted to its purpose. There is an opening chapter of a very elementary type, followed by another on the

general principles of river action. In the third chapter the author takes the Thames as an example, and describes its later history in some detail. The fourth is devoted to river-capture, exemplified chiefly by the earlier history of the Thames and the relations of that river to the Severn and the Trent. The fifth and last chapter deals with lakes, and here the treatment is somewhat cursory. The space allotted to the subject is too small, and the book would have been a still better one if no attempt had been made to deal with lakes, and the space thus saved had been devoted to the principal subject.

The book is well printed. The illustrations are not numerous, in spite of the statement on the title-page, but they are useful and clearly reproduced. There are seventeen in the text, mainly maps and sections, and one half-tone reproduction of a photograph as a frontispiece. P. L.

HUMAN AND HISTORICAL GEOGRAPHY

The Antiquity of Man.— **Sir Arthur Keith.** New and enlarged edition. 2 vols. London: Williams & Norgate. 1925. 9 × 6, pp. 266. *Illustrations.* 25*s. net.*

The great demand for the first edition of this work is striking evidence of the growing interest in anthropology, and has encouraged its author to enlarge it considerably in a second edition. The two volumes in which it now appears run to more than 700 pages, some 200 more than the first edition. This makes it possible to include at length the new discoveries of the last ten years, and to explain them fully in readable form. Moved by that apostolic fervour for the spread of anthropological knowledge, which does him so much credit, Sir Arthur Keith has evidently always before him the general reader as well as the expert, and he is to be congratulated on the clear way in which he has explained and illustrated the anatomical intricacies involved in his subject. He is at times, perhaps, not so critical as one would wish in dealing with discoveries in deposits of uncertain age; but as a set-off to this he always shows himself ready to modify his opinion in the light of new facts and criticism. As a guide and a help we believe that ultra-caution in dealing with this aspect of the subject is desirable and more serviceable. The discoveries at Solutré, Obercassel, and Malta; in this country the fossil remains of Baker's Hole and the Mendips, and the implements found in East Anglia; the Boskop skull and Rhodesian man of South Africa; the Talgai skull discovered in Australia, and the skulls found by Dubois at Wadjah in Java; and finally the two problematical teeth recently discovered in North America, all now come under review. But the *pièce de résistance* is still Piltdown man, to whom some two hundred pages are devoted, and the controversy on the reconstruction of the skull has apparently left the author convinced that his views regarding it expressed in the first edition are still valid. He describes with such lucidity and force the simian characteristics of the Piltdown mandible that one wonders how he is going to extricate himself from the conclusion that it cannot have belonged to the skull. But the state of fossilization and situation of the relics lead him, on the ground of probabilities, to the belief that they must both have belonged to the same individual. This entails the view that the genus *homo* may have at one stage of its evolution retained striking simian characters, exemplified by Piltdown man in his mandible, Pithecanthropus in his brain case. Only so is it possible to reconcile such anomalous and apparently contradictory characters. They sufficiently account for the scepticism which still exists in the minds of several competent authorities on this subject.

On the question of the antiquity of the remains of modern man Sir Arthur Keith has apparently somewhat modified his views. He is evidently shaken in his belief regarding the antiquity of the Galley Hill man. We have not yet found in fossil form, he remarks, a kind of man which represents the ancestor of modern man. We have not found the stage which lies between Rhodesian man and Modern man. Notwithstanding this blank in our knowledge, the evidence which is ever accumulating makes it more and more difficult to believe that Galley Hill and other examples of Modern man are really of the antiquity assigned them on geological evidence. In discussing this all-important problem he lays stress on the Talgai skull as the stage the most primitive of modern types (the Australian aborigine) had reached before the end of the Pleistocene period. The Talgai skull therefore, as representing the ancestral Australoid type, is the earliest form of true *Homo sapiens*, man of modern type, yet discovered, and necessitates for him a high antiquity; and the Australian native becomes the nearest approach to the common ancestor of modern mankind. He is an ancient and generalized type of humanity; he is not the direct ancestor of either African or European, but he has apparently retained the characters of their common ancestor to a greater degree than any other living race. If we reject Galley Hill man, the earliest European types are found in the Grimaldi caves and the rock shelters of Combe Capelle and Cro-magnon. Their immediate ancestors are not yet found. Nothing yet discovered suggests our part of the world as the homeland of Modern man: he appears in Europe as an intruder.

In the provisional Genealogical Tree, modified to include recent discoveries, the stems of Neanderthal, Piltdown, and Rhodesian man arise in early or middle Pliocene times, but they were all flourishing in the early Pleistocene. They have become extinct, and none of them is in the line of the ancestral descent of Modern man. This suggests that the evolution of Modern man has been more rapid than has generally hitherto been supposed.

Anatomy is proverbially a dry subject. But this work is one of the few examples showing how that art can be made a living one when treated by a master hand. E. A. P.

THE MONTHLY RECORD

EUROPE

Large Seventeenth-Century Maps of Italy.

Two years ago we reviewed (vol. 62, p. 211) Prof. R. Almagià's important memoir on the early cartography of Italy, concerned especially with the large map published in 1608 by G. A. Magini, of which he had brought to light the first specimen known in modern times. He has since continued his researches in foreign libraries, particularly in the Bibliothèque Nationale in Paris, and has been able to shed still further light on the productions of early Italian map-makers, which prove to have been much more extensive than has hitherto been supposed. The most important discovery is that of the large map compiled by the well-known geographer Giuseppe Rosaccio, and apparently completed in 1607, though possibly not actually published until a year or two later. (We referred a year ago (vol. 64, p. 62) to the presence of a single sheet of this map, out of nine, in a volume of miscellaneous maps lately acquired by the Society.) The whole map has since been reproduced by Prof. Almagià in the issue of *L'Universo* for December 1924, with a full

discussion of its sources, and notes on other productions of the Italian School during the seventeenth century. At the outset he recurs to the big Magini map of 1608, of which he has found a second example in the Paris National Library, in far better condition than the copy previously found, and accompanied by a long description of Italy printed on two strips joined to the right and left sides of the map. This proves to be an abstract, made by Magini himself, of the description prefixed by his son Fabio to the 'Italia' of 1620; so that the latter must have been written as early as 1608. While the Florence copy was so damaged as to be illegible at the lower edge, that of Paris is perfect and, besides an inscription, gives a most valuable series of scales of measurement, which permits us to compare three different Italian miles with English and German miles and French and Spanish leagues, and helps to elucidate a passage on the same subject in the 'Primum Mobile' published by Magini in 1609. Among later copies of the Magini map, the writer is able to report the discovery by Dr. F. C. Weider of one brought out by Hondius at Amsterdam in 1617, without author's name, and dedicated by Hessel Gerrits to R. Pauw and other Burgomasters of Amsterdam. The most important Italian re-issue is that of Giusto Sadeler of Venice (probably about 1650), of which a copy is also to be found in the Paris library, whilst a slightly later version (1662) exists in the British Museum.

To turn now to the newly found Rosaccio map: there can be no doubt that this is the 'Geografia delle Diecinove Regioni d'Italia' mentioned in an existing list of the works of Giuseppe Rosaccio, two other items in which, also described by the term 'Geographia,' are maps of Tuscany and Latium, printed at Florence in 1609 and 1615 respectively. Of these only the Tuscany is now known, and this has a dedication signed by the son Luigi stating that it was engraved by him from the drawing made by his father. The Italy bears an inscription stating that it was drawn and engraved by the son, but the analogy of the Tuscany justifies the conclusion that it was composed by the father. That the latter adopted L. Alberti's division of Italy into 19 "regions" is known from the "discourses" added by him to his issue of Ptolemy (Venice, 1598–99), though the description in these bears no close relation to the map produced some years later. A careful examination of the content of the map, aided by Prof. Almagià's unique knowledge of contemporary Italian cartography, enables him to determine with considerable precision the sources on which it was based. For a large part of it the most important were maps of Gastaldi, *e.g.* his general map of Italy of 1561, and his special maps of Lombardy and Piedmont. Other sources were: Magini's 'Romagna' of 1597; the maps of Tuscany by Bellarmato and Buonsignori; of the Kingdom of Naples by Prospero Parisio (1591); and various others, some not yet traceable. By the use of all these Rosaccio considerably modified the original version of Gastaldi. The map is very full of detail and shows on the borders a number of small plans of cities and towns, besides picturing the dress of Italians both ancient and modern. The sea spaces are also partly occupied by pictorial representations.

The Baltic Region.

In No. 1 of *Publicationes Instituti Universitatis Dorpatensis Geographici* (Dorpat (Tartu), 1925, pp. 22) Prof. Michael Haltenberger sets out to supply an answer to the question, "Gehört das Baltikum zu Ost-, Nord-, oder zu Mitteleuropa?" The author—Professor of Geography at Dorpat, in what was formerly the German University of the Russian Baltic Provinces but is now transformed into an Estonian institution—begins by discussing the relation-

ships of his "Baltikum," which he defines as the region included in the new states of Estonia and Latvia, and only when the term is expressly used in a wider sense will he admit Lithuania. The west, north, and east limits of the region are defined by the Baltic Sea, the Gulf of Finland, and the belt of marshy, lake-studded country which extends from the head of the gulf southward. This last belt is termed, after Penck, the "Vorangian border zone." It has here a width of about 200 kms. between Lakes Peipus and Ilmen, and thence extends to the valley of the Dnieper. It offered a fairly easy waterway for small boats from the Baltic to the Black Sea, hence its association with the Vorangians; but it is also a band of thinly peopled country which has long been an obstacle to movement between east and west, and it is in its northern half the eastern frontier of West-European cultural influence. From the Duna valley northward the eastern limits of Protestantism and of the Latin and German scripts nearly coincide with the boundaries of Latvia, Estonia, and Finland in this zone, which separates them from the Greek-orthodox (before the Revolution) Russia using a script of Greek origin. In its structure and relief Baltikum is regarded as part of the margin of Fennoscandia, while Lithuania is an extension of the North-German plain; but in its economic life it is mainly an agricultural country—rye, wheat, barley, and potatoes being the chief crops, while its neighbours Finland, Sweden (except the south), and North Russia base their economic life mainly on forest products. Thus its economic geography places Baltikum intermediate between Germany and Russia rather than in North Europe. The author points out that the rural inhabitants live for the most part in separate houses in the fashion of Scandinavia; while the towns show many evidences of German influence, modified in the newer parts by Russian styles of architecture introduced during the nineteenth century. In its politico-geographical relations he compares Baltikum and Lithuania with Holland and Belgium as small states holding important positions, commercially and strategically, among larger neighbours, with the vital difference that the small North Sea states are between better-balanced powers than are those of the eastern shores of the Baltic, since Sweden is not an effective counterpoise to Russia. Before the War nearly a third of the foreign trade of Russia was done through the ports of Baltikum, and it seems that the author somewhat underestimates the importance of this fact in emphasizing the separation from Russia by the marsh belt. It is of course true that this was mainly through Riga (Latvia) rather than by Estonian ports. Historically Baltikum has been at different times under German, Swedish, and Russian rule, and not until our own days have its people been independent, though they have maintained their distinctive language and customs. Lithuania on the other hand has been an important state, and has been under Polish and Russian, but not German, rule in the past. In conclusion Prof. Haltenberger answers his question by asserting that Baltikum is a distinct geographical unit in its physical and human conditions, belonging essentially to North Europe, but with important cultural relations to Central Europe and an economic position transitional between Central and Eastern Europe. And he states that he hopes to follow up his investigation.

This very suggestive essay might well serve as a model for investigations of regional relationships of transitional border lands. It is well documented, with many references to works published in Germany during the War period, some of which are not well known in this country. In itself it gives evidence of German influence in that its references are all German except for one map, one atlas, and a year-book in Russian. C. B. F.

ASIA

Names in Palestine.

When the "First List of Names in Palestine" (see *Journal*, 65, 355) was under consideration by the Permanent Committee on Geographical Names their draft was submitted by the High Commissioner for Palestine to a Sub-committee on Hebrew, and at their suggestion the scheme of transliteration from Hebrew given in the "Alphabets of Foreign Languages Transcribed into English according to the R.G.S. II. System" was revised in certain important particulars. The Committee have therefore published a leaflet of three pages with the revised transliteration for insertion in the original publication to supersede that which was there given. This leaflet may be had free on application to the Office of the Society.

Dr. Emil Trinkler's Journey in Afghanistan.

In 1923 Dr. Emil Trinkler, of Munich, previously known to geographers for a work on the geography of Tibet, set out on an expedition to Afghanistan for geographical and geological research. He reached Herat by way of Russian territory, and then crossed the country eastward to the capital, making geological observations and collections *en route*, besides studying the general morphology. As few competent geologists besides Griesbach and Hayden had previously been over the ground, we may expect some valuable results from Dr. Trinkler's study, a preliminary account of which has appeared in the *Mitteilungen* of the Munich Geographical Society, Band 17, 1924, Heft 2/3. In his journey across Afghanistan Dr. Trinkler crossed the ranges of the Sefid-Koh and the Bend-i-Baian, the latter at two different points, and gives some details as to their structure and composition. They seem to be bounded to the north by a great line of dislocation corresponding to the longitudinal valleys of the Herirud and Ghorband. The principal formations represented appear to be Palæozoic, and neither Jurassic strata nor the Cretaceous limestone so characteristic of Afghan Turkistan were seen. The whole region gives the impression of an old denuded mountain landscape, into which the streams are again cutting their beds by reason of renewed erosion. The forms vividly recall those of the region of inland drainage of Central Asia, to which in fact the greater part of the area belongs. Looking over the land from a point of vantage, the valleys and deep gorges are hardly noticeable. A striking feature is the presence in all the valleys of vast deposits of conglomerate, pointing to a former greater volume of the streams. From Bamian Dr. Trinkler crossed the western end of the Hindu Kush by the Ak Robat Pass into the upper valley of the Surghab, returning by the almost impassable gorge of the Bamian river, which he claims to have been the first European to traverse. This section is the subject of a special article in *Petermanns Mitteilungen* (1925, Heft 5/6 with sketch-map). While the main range of the Hindu Kush here consists of granites, porphyries, and other eruptive rocks, the mountains further north, separated from the main chain by the valley of the Surghab, are marked by vast deposits of Cenomanian limestone, with a generally east-to-west strike, beneath which is a broad red band of the Red Grit series of Hayden. The origin of the deep gorge cut by the Bamian river offers an interesting problem, the explanation of which seems to be that the stream once flowed at a higher level, and, when the last elevation took place, was able to cut down its bed rapidly enough to keep pace with the movement. Only one isolated trace of former glaciation was seen in this part of the Hindu Kush, though a few were observed in the Koh-i-Baba. But the vast deposits of conglomerate show that Afghanistan must formerly have had a pluvial period.

AFRICA

East Africa at Wembley.

We have received a copy of *East Africa* for July 2, prepared as a Souvenir Number of the East African exhibits at Wembley. Besides articles describing the displays of each colony or protectorate at the Exhibition, there are others dealing with matters of general interest. The whole forms a valuable survey of present conditions and future prospects in East Africa. Among the contributions may be noted those on Tanganyika territory by Mr. A. H. Kirby, the Director of Agriculture; Britain's work in the Sudan, by the Governor-General, Sir Geoffrey Archer; the Report of the East Africa Commission, by Sir Sydney Henn; Reckless Big Game Shooting, by Sir Harry Johnston; and some points concerning native labour, by Viscount Cobham. It will be seen that the ground is covered thoroughly, and many questions of the utmost importance discussed.

Derivation of the Name "Niger."

In the popular idea the name of the River Niger is no doubt generally connected with the Latin for black, but this is a mistake, as the name originated in Ptolemy's account of the two principal streams in the region South of the Atlas, as the Γείρ and the Νίγειρ, the second of which has been thought to denote the great river of the Western Sudan. Both names would seem to be variants of one vernacular term, and Mr. C. K. Meek, Government Anthropologist in Northern Nigeria, writes to suggest that its root may be traced in the generic term *Njer* or *Niger*, which he has found to be the word generally used for river by the Bduma of the Central Sudan. He says: "I feel certain that the words Niger, Nigeria, are derived from a Sudanic or Bantu root meaning 'river,' and this appears to be borne out by the existence of the root *ŋgira* among the Chinyai of South Central Zambezia, and *-gera* among the Nyanza tribes (see Sir H. Johnston's 'Comparative Study of the Bantu and semi-Bantu Languages' vol. 1, pp. 258 and 50)." This seems quite possible, if we accept the view that Ptolemy's two rivers were really those of the Sudan. But it must be remembered that a good many writers deny that Ptolemy had any knowledge of the Sudan. This latter opinion, held by Gosselin, Duveyrier, Vivien de St. Martin, Tissot, and others, was accepted by Karl Müller in his notes to the passage of Ptolemy describing the rivers of the interior (Book 4, chap. 6). Müller believed that, here as elsewhere, Ptolemy's positions were all shifted southward through the exaggeration of distances which marred most of the early attempts at mapping the African interior; and that the "Ger" and "Niger" were merely wadis of the Northern Sahara. In support of this view Duveyrier ('Les Touareg du Nord,' pp. 469 *et seq.*) pointed to the Berber ("libyque") root *gher* (also *ger*, *guir*, *djir*, *righ*), signifying running water in general, as the basis of the river-names adopted by Pliny and Ptolemy.

AMERICA

Temperature Conditions of Mexico.

A valuable contribution to this subject, translated from the Spanish of Jesus Hernandez, forms supplement No. 23 of the *Monthly Weather Review* published in 1923. It discusses observations from seventy stations scattered all over the republic except Lower California, on the basis of a ten-year record 1901–1910. On account of the extremely varied configuration of Mexico, and the steep temperature gradient connected with a somewhat

northerly position of the thermal equator in this part of the world, the thermal character of the country, though in the main tropical, is greatly diversified. The "hot belt" (*zona calida*), with a mean temperature of 72·5° F., embraces the coastal region together with the Isthmus of Tehuantepec, Peninsula of Yucatan, and States of Tabasco and Campeche; the "temperate belt" (*zona templada*) with a mean between about 60° and 70° F., occupies much of the northern interior of the country; the "cold belt" (*zona fria*) is relegated to small areas on the elevated plains or *mesetas* which, with an average elevation about 2000 metres, have a temperature ranging downwards from 59·0° F. (15·0° C.) to the freezing level of the great snow-clad volcanoes.

The course of the seasonal variation is somewhat complex, the warmest period occurring locally in any month between April and August, and the coldest in December or January, and very locally February. Whereas the northern extra-tropical portion of the country experiences the usual July maximum, the southern lies under the equatorial double-maximum regimen, though the first maximum soon after the spring equinox is the more pronounced. The intermediate region shows a "summer temperature anomaly," a drop of temperature in July due to cloud and rain separating an early summer maximum in May or June from a late summer, and in most places principal, maximum in August. (A similar feature occurs in the Sudan, and also in northern India, though in the latter the temperature after the conspicuous May climax remains steady.)

The thermal conditions of Mexico City at 2240 metres (7349 feet) above the sea, one of the few stations with a long record, are discussed in detail. The mean diurnal range is here 18·4° F., varying greatly according to season, and the mean annual range between the warmest month, May, and coldest, January, is 11·7° F. The mean annual temperature of the capital is 59·6° F. (May 64·5° and January 52·8°), so that, apart from tropical insolation, the climate though warm temperate is in no sense hot. The city is so far affected by the "summer temperature anomaly" that the temperature of August barely shows any decline on that of July, and at certain hours of the day is actually higher. A series of maps for each month and for the year shows the distribution of temperature according to surface isotherms and sea-level isotherms. The actual surface mean annual temperature is as high as 79° F. or above in the Isthmus of Tehuantepec and Peninsula of Yucatan, and slightly below 60° F. on one or two of the central plateaux of moderate altitude.

Reduction of temperature to sea-level presents a problem of some difficulty inasmuch as the vast extent of high-lying plateaux effectively precludes the application of a single numerical correction derived from the observed average rate for cooling with height on mountain slopes. Hernandez has adopted an indirect mathematical method, into the details of which we cannot enter here. The resulting isothermal maps (which comprise for comparison the United States and much of Canada in addition) indicate the distribution of mean monthly and annual temperature as controlled by latitude (radiation) and the various influences which for brevity may be comprised under the designation "continentality" (see *Journal*, vol. 64, p. 52). In July the very high sea-level isotherm of 89·6° F. is found over northern Mexico and the arid south-west states of the Union, whilst the site of Mexico City falls within that of 82·4° F. Since the actual July temperature of Mexico City is only 62·1° F., one obtains a measure of the loss of warmth due to the single factor of altitude, and it is in analyzing factors of temperature distribution that the common practice of reducing to sea-level has its value.

N

Mount Logan Expedition.

We have received from the Alpine Club of Canada a copy of the *Sunday Province* for May 31 with an account of this year's reconnaissance for the Mount Logan Expedition. Mr. A. H. MacCarthy, the leader of the expedition, with three packers, left railhead at McCarthy on February 17 to select a suitable route up the glaciers, and to lay advanced depôts. For the first part of the journey they were assisted in relaying the stores by two large horse bob-sleds. Beyond the Chitina valley they depended upon three teams of seven dogs each. The party had to contend with difficult conditions from the outset. The going was much worse than had been anticipated, and the dogs, after the good living of the town, at first refused their food; consequently they had to reduce their loads and make more frequent relays. On February 27 they reached Hubrick's Camp, at the head of Chitina Valley. The choice between two routes now lay before them: that over to the south side of the Chitina glacier, across the Baldwin glacier, and then up the Logan glacier, or that along the northern side of the Logan glacier. Mr. MacCarthy decided that the latter, though suitable for a lightly equipped party, could not be negotiated with his heavy loads. He therefore followed the first, the route abandoned by the Canadian Geodetic Survey in 1913.

The journey across the glacier was made difficult by the strong winds, which obliterated the trail blazed by the leader. They pitched camp on the farther side, beyond "a narrow right-angled passage between bold granite cliffs about 150 feet high," called by Mr. MacCarthy the "Gorge of Fate." Here the bob-sleds returned, as the horses were helpless in the deep snow-drifts. The main supplies were still below the gorge. The last portion of the journey through it lay across a log bridge at a spot called the "Devil's Door." While the party was at the advanced camp, with little food or equipment, an ice avalanche blocked the gorge and flooded the route with 10 feet of water. After a détour of several hours across the glacier, they succeeded in regaining their stores. They then found that the ice dam had given way under the pressure of water, and the gorge was open once more. With all possible speed they hastened to get their stores through, "before the ice abutments of our log bridge began to crumble due to melting and erosion by the muddy water." This was accomplished, and "five minutes later the great slab cracked and settled at its upper end, closing the Devil's Door for further ice travel."

The following day, Mr. MacCarthy set out to prospect a route across the glacier to Chitina Mount point, where a depôt was to be laid. When halfway across he was overtaken by a snowstorm, and being without a compass, lost himself completely. Having discovered he was wandering in a circle, he managed to pick up a straight line again, and reached the Devil's Door after five hours in the snow. Three days later the depôt was laid, and the journey resumed. The next stage, beyond the junction of the Baldwin and Logan glaciers, was the worst, but the going improved when the smooth white ice of the Logan was reached. On April 3 they camped near the International Boundary, and in the following week established an advanced base camp 9 miles up the Ogilvie glacier, at an altitude of about 8000 feet, where they cached 4700 lbs. of stores. On April 14, two weeks behind their schedule, they began the return journey. This they covered in twelve days, being but lightly loaded, though they were delayed by open water in the Chitina valley. As already noted in the *Journal*, the main party was to leave Seattle for Cordova, Alaska, on May 2.

Since the above was written, a telegram has been published in *The Times*

announcing the successful issue of the expedition. On June 23, a party of six reached the summit (19,800 feet) as shown on the maps, to find a higher peak still before them. After a difficult climb, cutting nearly all their way, they reached the true summit at 8 p.m. A blizzard forced them to pass the night in a dug-out in the snow. On the following day, half the party descended to the plateau, but the rest, through exhaustion, were not able to follow until June 26. They all then got down to King Coal camp, encountering a hurricane on the way.

OBITUARY

Henri Cordier.

It is with great regret that we record the death, on May 23, of M. Henri Cordier, President of the Société de Géographie, and Honorary Corresponding Member of our Society. Born in New Orleans in 1849, and educated in Paris and in England, M. Cordier spent several years in China, during which time he laid the foundations of his profound knowledge of, and sympathy with, the Orient, its peoples and its cultures. Returning to France in 1881 he became a Professor in the École des langues orientales vivantes. With the publication, in collaboration with M. Ch. Schefer, of the 'Recueil de voyages et de documents pour servir à l'histoire de la géographie, depuis le XIII[e] jusqu'à la fin du XVI[e] siècle,' M. Cordier made himself one of the leaders of the modern school of historical geography. In 1903 he was entrusted with the preparation of a third edition of Sir Henry Yule's 'Book of Ser Marco Polo, the Venetian,' while he also re-edited later for the Hakluyt Society Yule's 'Cathay and the Way thither,' besides publishing a volume of 'Notes and Addenda' to the former work. He was also a co-founder of the Oriental miscellany, 'T'Oung Pao.' Among his many other publications his volumes on the bibliography of Indo-China, China, and Japan must be mentioned. M. Cordier had many other interests, and was an extensive traveller. In 1905 he visited South Africa with the British Association. More detailed appreciations of his work have appeared in *La Géographie* for April–May 1925.

A. Cattaui Bey.

We have to record, with great regret, the death of Adolphe Cattaui Bey, Secretary-General of the Royal Egyptian Geographical Society, on June 11, in his fifty-ninth year. This will be particularly regretted by those who were present at the recent Geographical Congress at Cairo, for to his work as Secretary General was largely due the success of that meeting. These services had recently been recognized by King Fuad I. in making him a Grand Officer of the Order of the Nile. He was also a Chevalier de la Légion d'Honneur. His ever-ready helpfulness, amiability and tact made him a colleague with whom it was a constant pleasure to be associated, and it will be very difficult to replace him in the post which he occupied with such distinction and ability.

W. F. H.

Dr. A. Litton Forbes.

We regret to announce the death, on May 8, of Dr. A. Litton Forbes. Dr. Forbes was one of the oldest Fellows of the Society, having been elected in 1874. By profession a specialist, he was keenly interested in nature, and had travelled extensively. In 1875 he published an account of a visit some years

previously to Fiji, under the title 'Two Years in Fiji.' He was also a prolific writer of articles on physiological and historical subjects. Just before his death, although eighty years of age, he was planning to visit East Africa.

Dr. Oscar Lenz.

By the death of Dr. Oscar Lenz on 2 March 1925, recorded in *Petermanns Mitteilungen*, 1925, Heft 5/6, one of the last links with the great period of African Exploration in the latter part of the nineteenth century has been broken. Born at Leipzig in 1848 he studied natural science, particularly Mineralogy and Geology, in the University of that city, and after taking his degree moved thence to Vienna, where he took service at the Geologische Reichsanstalt. His ambition to do work as a scientific explorer was first gratified in 1874, when he joined the expedition to West Africa fitted out by the German African Society. His most important journey, also in the service of that Society, was begun in 1879; it took him across the Western Sahara (for the first time since Caillié's journey) from Morocco to Timbuktu, and was described in his two-volume work 'Timbuktu,' which has since remained the standard authority for that part of Africa. Returning to Vienna, he became Secretary of the Vienna Geographical Society, and in 1885 was entrusted by it with the leadership of an expedition to the Congo basin, planned with a view to communicating with Emin Pasha in the Egyptian Nile Province. This proved impossible, but in company with Dr. Oskar Baumann he effected the crossing of the continent, a by no means ordinary feat in those days, by way of Lakes Tanganyika and Nyasa. After his return home he became Professor at the German University at Prague, from which post he retired in 1910, keeping in close touch however with scientific and geographical circles in Vienna. Besides his larger works he published a large number of lesser papers.

MEETINGS: ROYAL GEOGRAPHICAL SOCIETY: SESSION 1924–1925

THE ANNIVERSARY DINNER

THE Anniversary Dinner of the Society was held at the Connaught Rooms on Monday, 15 June 1925.

The President, the Earl of Ronaldshay, and the Countess of Ronaldshay received the company, which included, as guests of the Society, the Earl and Countess of Reading, H.E. the Spanish Ambassador, H.E. the French Ambassador, Sir John Baird, Governor-General of Australia, and Lady Baird, Sir Geoffrey and Lady Archer, the President of the Royal Academy, the Vice-Chancellor of Cambridge University, Sir Henry and Lady Wheeler, Vice-Admiral the Hon. Sir Hubert Brand, Sir Charles and Lady Macleod, Mr. and Mrs. Eric Maclagan, Mr. and Mrs. Stephen Gaselee, and Dr. Wieder.

After the loyal toasts had been honoured, The EARL OF READING, in proposing the toast of "The Society," said: Immediately on my return from India I received a letter from your President inviting me to be present at the Anniversary Dinner of the Society. I accepted with alacrity because the name of your Society is familiar not only in India but throughout the world. I am thrilled with admiration for the record of achievements of this Society. An additional factor influencing my ready acceptance of the invitation was the

very high regard that I have for your President, Lord Ronaldshay. But most things in life are tempered with some little disadvantage, and I found, as time progressed and we neared the date of the dinner, that the request was conveyed to me to propose the toast of the evening, which is that of the Royal Geographical Society. Whatever I may have done in life, however little it may have been, I searched my mind, I investigated all records at my disposal, for the purpose of ascertaining what I could claim to have fitted me to propose the toast of "The Society." Alas! I could not find one event of my life worthy of being mentioned amongst the members of this distinguished Society. But, nevertheless, looking around for some explanation, I came to the conclusion that perhaps my admiration for the Society would excuse my lack of achievements; and I reflected also that possibly it was not inappropriate to ask me, the Governor-General of India, to propose this toast. It is the first time that the Governor-General of India has had the honour of attending at your table; and necessarily so, because only last year the Statute was passed which enabled the Governor-General of India to come home and spend a little time in England. Moreover, I realized that many of your achievements, wide and far-flung as they are, have taken place in Asia and in India, and therefore I set myself to prepare from the records of the Society a learned discourse on the technical subjects of the Society. But later I came to the conclusion that it would be better if I reserved that dissertation for a more suitable occasion. I therefore propose to address you but briefly, indeed, little is required of me to commend to this assembly the toast placed in my charge.

I am struck with one illustration of the habits of Englishmen. This Society had its origin, as many other institutions, in a dining club started, I believe, about the year 1826, when those who had inaugurated the club met together and discussed the various questions of interest to them. I have tried to picture to myself a meeting of that dining club; the various members sitting round the board, each prepared to learn from others, and perhaps each especially intent upon that part of the globe which he had made his own, eager to discuss it with the assembled company and to enter into disputation regarding it. This Society, I have learned, was founded in 1830, four years after the inauguration of that dining club, and now it approaches its centenary. It is hale and hearty, strong and vigorous, with an ever-increasing family, as is but natural and right; for I observe from the address which the President delivered this afternoon that the membership is ever increasing. Thus this Society continues to expand, and I believe that it has at present a membership of 6140. Strange to relate, even in these days of heavy taxation and when the income is not always equal to the demands, the financial position of the Society is also firm. That is a tribute to your Society, because it is too common experience that as the family increases the finances decrease.

I observe that in your reference to the events of the last year you, Mr. President, mentioned various members of the Society who have passed away, which led me to think of the relation to India of at least two distinguished names included in the sad record. In 1911 the late Lord Curzon became a President of your Society. No more appropriate president could have been selected. This is not the occasion to dwell upon his many virtues, capacities and merits, but speaking to-night as a Governor-General I cannot refrain from reminding the assembled company that Lord Curzon has written his name in letters of gold upon the scrolls of India. I am not at this moment referring to the political affairs of India; I am thinking of tombs, temples, forts, and monuments of archæological, historical, architectural, and artistic interest in India. I have

had opportunities of visiting many. These are now well cared for instead of crumbling and neglected. Their preservation and maintenance in appropriate conditions under Government care and supervision and at the public charge is mainly due to Lord Curzon, and all lovers of beauty owe him a deep debt of gratitude for having initiated and established this policy which succeeding governments have been glad to follow. It has been my privilege to visit Agra on various occasions for the purpose of enjoying the beauty of that wonderful monument, the Taj Mahal: I have never visited it without reflecting upon Lord Curzon and paying my tribute to his cultured appreciation and loving care of history, architecture, and generally of art and beauty in India. Possibly there may be controversies regarding the political achievements of Lord Curzon in India and elsewhere; but none will ever dispute that he is entitled to high distinction among Viceroys, and notably for his labours in the field to which I have just referred. All will join in grateful acknowledgment of his fine service in this direction.

I think of another departed friend of India who was a member of your Society, Lord Rawlinson, the son of a President some fifty years ago of this Society. Lord Rawlinson has passed from us but recently. He was a very great soldier; I need not dilate upon his achievements in that respect; they are too well known. But I take this opportunity of telling those who are not aware of it that Lord Rawlinson had qualities which are not often found in a great commander of military forces. He had great political insight, shrewd perception, calm judgment, together with a faculty of sketching on a half-sheet of note-paper with a few lines and curves an exact indication of the situation of some particular event in India. Again and again it was my good fortune to ask him, as Commander-in-Chief in India, to explain to me the situation in a locality where trouble was, and those who knew him and the talent he possessed for making sketches will appreciate my remarks. He believed that the art of sketching for the purpose of explaining a locality and expounding its geography was part and parcel of military science. I leave his memory to-night with the observation that he was a most highly valued colleague, a highly prized friend, and a most loyal and devoted servant of India and of the Empire.

Mr. President, we in India have had the greatest interest in the efforts of your Society regarding the expeditions which you, in conjunction with the Alpine Club, initiated for the purpose of conquering the summit of Mount Everest. We have watched with the keenest and deepest interest all that has happened. I see General Bruce, whom I had the pleasure of meeting when he was in India, a great leader of expeditions, and I trust I may be permitted to congratulate him on having received the Founder's Medal of this Society. I observe that there is further reference to be made to him later in the evening, and that he will be called upon to address us. I cannot leave the subject without reference to those two heroic souls, Mallory and Irvine, who endeavoured to get to the top of the Earth, to soar into the empyrean until they reached the topmost pinnacle of the Earth's surface. I recall the thrill with which we in India learned that an ascent up to 28,000 feet without the use of oxygen had been made by the members of the Mount Everest Expedition. Then came the tragic information that both those gallant climbers had met their death in their attempt to wrest the secrets from Mount Everest.

And then I approach you, Mr. President. When I first went to India as Viceroy you were Governor of Bengal. You had charge of that important Presidency. Though many may be inclined to forget, there are some in this

room who will not fail to remember the difficulties that confronted us in India during the years 1921–1922. If I ventured to speak of them I might be led into political questions before you who are geographers and not to-night concerned with such matters. Therefore, all I shall say is that the period gave cause for anxiety; there was trouble, and it was not easy to foresee what would happen. Fortunately we had Lord Ronaldshay as the Governor of Bengal. He remained perfectly calm and undisturbed; he gave of his best to Bengal, to India, and to the Empire; he never allowed himself to flinch from the duties imposed upon him; whilst he brought sympathetic understanding of the Indian point of view he has always preserved his sense of responsibility to His Majesty the King and the British Empire. Permit me to recall with great pleasure the way in which those duties were discharged at that critical moment by your President. Whatever the future may have in store for him I am convinced that Lord Ronaldshay will always be true to his mission and acquit himself faithfully, conscientiously, and with distinction. You are about, Lord Ronaldshay, to vacate the high position you have occupied for three years as President of this Society. You are a distinguished traveller. You have laboured for the promotion and the diffusion of geographical knowledge. You have written various volumes from time to time. You travelled as a wandering student in the Far East, and when you returned gave us a bird's-eye view of India. You journeyed to the land of thunderbolts and later dived deep into the mysteries of the heart of Âryâvarta. It is therefore appropriate that your name should be coupled with the toast, and in asking this assembly to drink to the health of this Society, I remind you that when Lord Ronaldshay vacates his post to-night when he leaves here, he will be followed by another distinguished member, Dr. Hogarth, who has done much for the benefit of the Empire, and who did fine service in the war. He is, I believe, a Gold Medallist of your Society—itself a proud distinction; and is eminently fitted by his attainments to occupy the proud place to which you have called him. Sir, it is a comforting reflection that however exalted the position and however exacting its requirements, the right man will be found to fill it, prepared to assume charge and to render public service. Dr. Hogarth has been wisely chosen to lead your Society further forward in the interests of civilization and to promote the progress of humanity. I congratulate Dr. Hogarth upon his appointment as President of the Royal Geographical Society. I give you the toast of the Royal Geographical Society, coupled with the name of Lord Ronaldshay, the President.

The PRESIDENT, in responding, said: No one who is acquainted with the wide knowledge of men and affairs of Lord Reading, with his acutely critical mind, and with his mature judgment can remain indifferent to commendation coming from his lips. Judgment passed by such a man, one flatters oneself, must assuredly be sound, and it is only when there flash across one's mind recollections of the brilliant powers of advocacy of Mr. Rufus Isaacs, of the many verdicts snatched by the consummate skill with which he plied his art, that doubts arise to disturb the complacency of one's mind. One then recalls the fact that with the unerring instinct of a mother Mrs. Isaacs once addressed him in words which are, surely, destined to become historic: "My son, you are made for the bar." And if inclination would have me suppose that I have been listening to the deliberate judgment of a man who, as Lord Chief Justice, has sat in the seat of Ellenborough and Tenterden, Denman, Campbell and Cockburn, Coleridge and Alverstone, modesty compels me to the conclusion that this is rather a case in which I have been fortunate enough to be

the party on whose behalf has been pleading the most skilful and most persuasive advocate of the day.'

Lord Reading's kindly references to this Society bring vividly to my mind the fact that this is the third successive year in which it has fallen to my lot to respond to this toast as its President. It will be the last, and I gladly take this opportunity, therefore, of expressing my obligation to the Fellows and to the Council of this Society for the trust which they have reposed in me. And I would add once more my tribute to the permanent staff of the Society for the manner in which they have devoted themselves to furthering its interests.

I had an opportunity this afternoon of referring to what may be described as the more serious side of the work of this Society, and I will devote my remarks this evening to a consideration of the advantages which it offers to the average individual who is not necessarily a scientific geographer but who finds in travel the best antidote for that monotony which is unhappily, but apparently inevitably, the attendant upon the average well-regulated life. No one consciously courts monotony, yet we all know how easy it is to fall into a groove and to stop there. Indeed, I might go further and say how extraordinarily difficult it is to avoid doing so. Many of us know by experience that travel is the best means of lifting us out of life's ruts and of introducing into our lives new interests. And if we do not know it from our own experience, we at least have it on good authority. William Cowper, the poet, rather dogmatically, perhaps, in the light of modern knowledge, declared that "the Earth was made so various that the mind of desultory man, studious of change and pleased with novelty, might be indulged." And we have it also on the authority of another great man that "travel not only enlarges the mind, but adds dignity to the character of man." Boswell has left it upon record that Dr. Samuel Johnson, even if his journey to the Hebrides was the farthest as it was, according to his own statement, "the pleasantest he ever made," talked "with uncommon animation of travelling into distant parts, that the mind was enlarged by it and that an acquisition of dignity of character was derived from it." Well, the Royal Geographical Society, as Lord Reading has reminded us, grew out of a dining club which came into existence for the special object of stimulating interest in travel, nearly a hundred years ago. At its formation in 1830 it boasted a roll of 460 Fellows. Those of you who have studied, and I hope all of you have, the Report which your Council presented to you this afternoon will know that on March 31 last the 460 Fellows of 1830 had become 6140. And just as the object of the dining club of 1827 was to encourage travel, so the object of your Society is to provide you with every possible stimulus and facility for visiting distant parts of the Earth.

In the early days of the Society the Council recorded its desire that "no work relating to geography, no map or chart extant should be wanting to the Library." I may claim, I think, that successive Councils have done much to give effect to that most admirable intention. We have a Library at the present day of some 80,000 volumes, including volumes in French, German, Spanish, Portuguese, Italian, Norwegian, Dutch, Danish, Austro-Hungarian, Russian, Finnish, Greek, Latin, and several Oriental languages. In our map department we have 168,000 maps and charts; 1500 volumes of atlases; 62,000 photographs, and 18,000 lantern slides; and upon our shelves repose some almost, if not quite, unique examples of the cartographer's art. There are to be found the original manuscript maps made by travellers like Livingstone, Speke, Grant, Baker and Stanley, and, even more valuable, we have the only known copy of Hondius' great Map of the World upon Mercator's

projection of 1608; besides which we have 23 editions of Ptolemy; 10 of Ortelius, and 7 of Mercator.

Then again, we provide the would-be traveller with instruction in astronomical observation and the science of surveying, and many of those who have taken advantage of this provision have since won the Gold Medal of this Society and have acquired world-wide reputation as travellers. I need only mention as examples the late Lord Curzon, Mr. Douglas Freshfield, Sir Martin Conway, Boyd Alexander, Douglas Carruthers, and Hamilton Rice. Many of these distinguished travellers who have learned their art in our school have given tangible expression to their gratitude to the Society. Mr. Hamilton Rice continues to send pupils to our school from America in order that they may learn in the same school, the School of the Royal Geographical Society, in which he was a pupil.

The benefits that Lord Curzon conferred upon this Society are numerous and well known, but there are perhaps some smaller gifts made by him which may have escaped the notice of some of the Society's Fellows. Those who are familiar with the late Lord Curzon's monumental work upon Persia will, perhaps, recall his illuminating remarks on the ordinary method of travel in that country, namely, by post-horse. "As you emerge from the post-house," he tells us, "and try the paces of your new mount, there is a moment of acute suspense. Within 300 yards you know whether your next three or four hours will be a toleration or an anguish." He was deeply impressed with the amount of punishment which the Persian post-pony was capable of taking, and he describes in moving language how these sorry animals are "urged and flagellated"—I am using his own words—"across the country." "The post-boy carried, and each rider must carry, a long whip made of twisted leather." Ladies and gentlemen, the "long whip made of twisted leather," with which Lord Curzon "urged and flagellated" the Persian post-pony across more than 1000 miles of Persian post-track, reposes in our Museum, and is open to the inspection of any Fellow who feels moved to follow in Lord Curzon's footsteps. Indeed, our Museum is full of objects recalling some of the most dramatic and interesting passages in the history of the exploration of the Earth. You may see there, for example, a pathetic relic of Arctic exploration in the shape of the bag empty of provisions, left by Scott and his party when they met their doom, which was subsequently discovered and brought back to this country as a monument to the memory of those gallant explorers. But perhaps the most interesting of all our treasures are the cap with the gold band round it, worn by Livingstone, and the helmet worn by Stanley when he discovered Livingstone at Ujiji, in the heart of Africa. For these two pieces of apparel played a prominent part in what must be described as being at once the most dramatic and the most pathetic, and yet the most humorous episode in the annals of exploration. Livingstone had left Zanzibar in March 1866, and thereafter had been swallowed up in the tropic forests of equatorial Africa. Not for days nor for weeks nor for months, but for years the baffling mystery of the African Continent descended upon him and cut off all trace and knowledge of his being and his whereabouts. He was found by Stanley at Ujiji in November 1871, and Stanley has left on record the description of that momentous meeting. "As I advanced slowly towards him," he says, "I noticed that he was pale, had a grey beard, wore a bluish cap with a faded gold band round it." And having given us this first glimpse of the man whom he had come to find, he goes on to tell us of his feelings. "I would have run to him; would have embraced him, only he being an Englishman I did not

know how he would receive me. So I did what cowardice and false pride suggested was the best thing. I walked deliberately up to him. I took off my hat "—the helmet that reposes in our Museum—" and said, 'Dr. Livingstone, I presume.' 'Yes,' said he, lifting his cap slightly "—the blue cap with a gold band which reposes in our Museum. And Stanley continues, "I replaced my hat on my head and he put on his cap, and we both grasped hands." A sufficiently laconic description, surely, of so momentous a meeting.

I have given you an indication, I hope, of the interest which our Society must possess for every man and woman who is interested in travel and exploration. You are to be presided over for the next three years, I hope, by Dr. Hogarth. You, as I, have every confidence that Dr. Hogarth will maintain the best traditions of this Society; and while I express to Dr. Hogarth, on your behalf, your best wishes for a most successful term of office, I venture at the same time to congratulate you upon the excellence of your choice in the matter of a President to rule over you.

Major-Gen. LORD EDWARD GLEICHEN: I have much pleasure in rising to propose the health of our two Gold Medallists this year, Brigadier-General the Hon. Charles Bruce and Mr. A. F. R. Wollaston. General Bruce, who has been awarded the Founder's Medal, has, as you are no doubt all aware, spent nearly the whole of his service in India and nearly the whole of that time in close connection with the Himalaya. Ever since he joined the Gurkhas he has been desperately keen on mountaineering, and many are the expeditions he has made, to Hunza, Kulu, Nanga Parbat, to Lahoul, and many other places of which, I regret to say, I have never even heard the name, to the Nepalese frontier, and in Kashmir; and, what is more, he has studied and explored these ranges to great effect, for he has given us a couple of excellent books on the subject. In the first of these, entitled 'Twenty Years in the Himalaya,' he has modestly compared his efforts to those of a needle trying to pierce a bolster. Ladies and gentlemen, when he rises to respond to this toast you will have an opportunity of observing his needle-like proportions. But wherever he has been he has always done good solid geographical work, and it is for this reason, combined with, as you know, his leadership of the 1922 and 1924 Mount Everest Expeditions, that he has been awarded our highest distinction. Not only has he done excellent work for geography, but he has consistently and thoroughly trained his Gurkhas in mountaineering and led them to the storming of the hilltops not only of Hazara, Miranzai, Waziristan, and Tirah, but also of Gallipoli in the Great War, where, amongst other things, he was wounded. He talks Gurkhali—which I am told is a horrible and very difficult language—most fluently; he can crack jokes and sing songs in Gurkhali as well as in English; and he is adored by all his followers, of whatever nationality. He has also, or had, the reputation of being the strongest man in the Indian Army. But what I am sure he considers an even greater distinction than the Gold Medal we have given him is the fact that he was chosen leader of the Mount Everest Expeditions of 1922 and 1924. He was debarred by a most unfortunate attack of malaria from completing his leadership of the last Expedition, and our deepest sympathy, in consequence, goes out, not only to him, but also to the sturdy and gallant porters who had to carry him down. General Bruce has now been elected President of the Alpine Club, and I am sure that you will all join with me in hoping that when the final conquest of Mount Everest takes place he will be there to see it done.

Mr. Wollaston, who has been awarded the Patron's Medal, has done equally good geographical work for many years in many parts of the globe. He has

done much mountain climbing; he has had a go at Mount Ruwenzori in East Africa, has travelled in the Congo, and has twice attacked the Carstenz range in Dutch New Guinea. He was unfortunate in the first expedition, but he led the second with great tact and excellent handling of natives, and was the first white man to get close under the snows of the mountains in that part of New Guinea. For this he was awarded the Gill Memorial in 1914. I might add that he is a Member of the Royal College of Surgeons and of the Royal College of Physicians. He acted in the Great War as a naval surgeon in East Africa, and also helped to fight the Bolsheviks in Murmansk after the war was over, receiving for his services the Distinguished Service Cross. He was also employed in the first Mount Everest Expedition as medical officer and naturalist, and only last year he carried out with his wife a daring little trip in the Sierra Nevada of Santa Marta, in Colombia, South America, a most difficult place to get at; but he assures me that he is going to have another attempt at it. All this is a record of which any man might be proud. I have only to add that he has written in charming language of his experiences in a couple of books of travel and reminiscences, and also in numerous valuable articles in the *Geographical Journal*. In addition, he has also published an excellent 'Life of Alfred Newton,' late Professor of Zoology at Cambridge. With all this work to his credit, I think you will agree with me that the Council is thoroughly justified in awarding Mr. Wollaston the Patron's Medal. I give you the health of our two Gold Medallists, General Bruce and Mr. Wollaston.

Brig.-Gen. the Hon. C. G. BRUCE, in responding, said: I think I must begin by congratulating the Royal Geographical Society, and also the Alpine Club, on the enormously improved relations existing between the two societies. That has not always been the case. We now see eye to eye on many points. To-night both Gold Medallists belong to the Alpine Club, and I am authorized to say that that Club congratulates itself on that point in particular. Both of us are being signally honoured for travel which was almost entirely exploration in different mountain regions—entirely on my part, at any rate. But I should like to point out that nearly all work in the Himalaya and analogous ranges is different from Alpinism. These journeys partake infinitely more of the character of mountain exploration, but I cannot urge too strongly the immense benefit which will accrue to all travellers and explorers in great mountain countries by a thorough grounding previously, not only in the technique of mountaineering—that is, the actual overcoming of difficulties—but also in an acquisition of a thorough knowledge of snow and ice conditions such as can be obtained, I think I may say, only from thoroughly experienced Alpinists, whether professional or amateurs. There are in Asia great tracts of country which require exploring, whether that country be almost entirely new, such country as formed the subject of Mr. Skrine's recent paper "The Alps of Kungur," or whether it be the intimate exploration of almost unvisited peaks and glaciers. Our outlook since the Mount Everest explorations has greatly changed. We took certain things for granted. Perhaps I should say that the most important factor in our advance was the psychological outlook, and that, I am certain, was a very important one. Not so many years ago the minds of explorers were, so to speak, dominated by the idea of altitude. We did our best to believe, and our best improved from one expedition to the other, that any one not a cripple would be happy and comfortable at 23,000 feet. When that view had well soaked in, it was extraordinary how little the minds of all were oppressed by the altitude bogey. I find in an old *Alpine Journal*, in writing a memoir of the late Captain Todd and a remarkable campaign he made

in the Lahoul Himalaya in 1912, that I said I was perfectly certain, from the pace that he and his guide Furrer climbed to 21,000 feet or so, that a height of 27,000 feet could be reached without the use of oxygen. I feel happy in knowing now that I underestimated that possibility.

I will conclude by telling you how the first plan for the attempt of the conquest of Mount Everest occurred. One night in January 1893, when the Robertson Mission to Chitral arrived at a camp called Gupis, I was summoned by Sir George Scott Robertson and by the second-in-command, Sir Francis Younghusband, and asked whether I was ready to join in their plans for an attempt to reach Everest from the north. These plans were further developed, but had to be abandoned. Nevertheless they did form the actual first formulated suggestions for the conquest of Everest, and it is interesting to look back upon what was done. There were two attempts made after that and before the first Royal Geographical Society and Alpine Club joint expedition in 1921.

Before sitting down I should like to offer the thanks of the Mount Everest Expedition to His Excellency, the Governor-General of India, Lord Reading, for the enormous help we obtained and for the sympathy he extended to us and his good offices in overcoming many of our difficulties.

Mr. A. F. R. WOLLASTON said: Mosquitoes, leeches, snakes, the attacks of savage men and savage beasts, hunger and thirst, extremes of heat and cold, are some of the drawbacks which the traveller expects when he pursues his curious ends. But speech-making is not part of his usual routine. However, it is a small price to pay for the honoured position in which I find myself to-night. Mr. Secretary Hinks told me that all you required was two or three impromptu remarks and then I might sit down. Greatly to your advantage, General Bruce has already filched from me my carefully thought-out impromptu remarks, and so I might, without further ado, sit down. But there is a member of the Council who told me in almost so many words that he only supported the suggestion that I should receive a Gold Medal of the Society because he knew that if I got it he would see me make a speech! He did not say *hear* me. He wanted to see me. I am sorry I cannot see him!

A few, a very few, exploring people have made great journeys, as you may say, on their own flat feet; that is to say, unattended by any hired assistants. For instance, such great men as Captain Scott and his companions, who carried their food with them to the end. But most travellers are dependent, to a very great extent, on a horde of animals—donkeys, mules, oxen, ponies, dogs, yaks, camels—and two-footed assistants of any colour, from palest yellow to blackest black. Without the help of these assistants very few of the journeys for which people get gold medals would have been accomplished, and very few of the recipients-to-be would come home. Some of these coloured people—and I speak from my own experience—have on more than one occasion saved our lives, and many of these same coloured people we are content, we are proud, to call our friends. On behalf of those unnamed people who really have to share in the Gold Medals, and on behalf of past Gold Medallists, present and future medallists, of whom, no doubt, there are several present, I wish to thank you most sincerely for the kind way in which you have received this toast.

Dr. D. G. HOGARTH, in proposing the toast of "The Guests," said: We have a most varied and distinguished body of guests with us to-night, and it is not easy to deal at once briefly and adequately with them. We greet, first and foremost, the distinguished representatives of two great nations of which the President has already spoken. Both these nations have been notable

pioneers in the discovery of the world. Spain, perhaps, a little the first in time, the more reckless, perhaps the more romantic, though it is hard to distinguish them in that particular respect. At any rate, what was ever more romantic than Spain's long quest of Eldorado? What more romantic than its result, the Spanish America of to-day, which has solved so amazingly the greatest problem of colonization by the fusion of conqueror and conquered? France, as I said, a little later in time, but throwing her net very widely—to Canada, the Southern States, the West Indies, the South Seas, India, Indo-China, and last, but not least, North-West Africa. As my particular study in life has been ancient things, may I be allowed to emphasize the uncontested priority of France in one field of exploration? that is in the rediscovery of the treasures and the highest civilizations of the ancient world. To the distinguished representatives of those two great nations the Fellows of the Royal Geographical Society here present offer their most cordial greetings.

By a very easy transition, with little sense of change of level, we pass to a Governor-General of India—I prefer the old term "Viceroy"—holder of the greatest office open to a subject, an office of which the notorious difficulties have never been more difficult than during Lord Reading's tenure. The very cordial reception we give him to-night is inspired by a deep sense of gratitude to one who, having gone through the harrowing and exhausting experiences of the war, shouldered for us the heaviest burden of peace. I am sure every one here would wish that I should include explicitly in that welcome Lady Reading, of whose sympathy and success in discharging the duties of her high station we have heard much. May I also include Sir Henry Wheeler, the Governor of Bihar and Orissa, with whom comes Lady Wheeler? I am told that Sir Henry Wheeler has been in India for eight long years, and that he has not been home since before the end of the war. Now that he is here after so long an interval, does he feel like Rip van Winkle? or does he, after a glance round this room, feel that things are going on after all in the old sweet way? We have with us, too, Sir John Baird, the newly elected Governor-General of Australia, and Lady Ethel Baird. Successful administrative and social work in this country justifies us in expecting much from them. They go out to command a whole continent, and in that tremendous task they have, I am sure, our good wishes. But what, as geographers, we should first and foremost wish of a Governor-General of Australia is that at the end of his term the map of that continent may be a little less easy for schoolboys to read than at present—a little less like the life of that king in French farce, who claimed that he would be the favourite of children for all time, because he had contented himself with only two dates—those of his birth and his death. They may not be able to make two blades of grass grow where one grows now—in some parts there is not the one blade to start from—but at least, will they leave two white men in that continent for every one they find? We greet yet another administrator of a great patch of the Earth's surface—Sir Geoffrey Archer, and with him Lady Archer. It will be fresh in your memories after what recent tragic happening Sir Geoffrey Archer was called to the Sudan, to deal with disturbers of its peace, much more subtle than that Mad Mullah with whom he used to deal. Well, the Sudan is not the ideal of God's own country; but nowhere is man so greatly modifying geographical conditions in the hope of making it so. He, again, has all our good wishes.

We are particularly glad to see here to-night a representative of the Admiralty, the Second Sea Lord, Vice-Admiral the Hon. Sir Hubert Brand. Not merely for the pleasure of his company, but because he represents our oldest

departmental friend. The friendship between this Society and the Admiralty has run the usual course of true love, that is to say, it has not always run quite smoothly; but it has always been renewed, and I am sure we hope it will always be maintained. Finally, to coordinate this remarkable group of Imperial officers and to emphasize the fact that all their varied activities tend towards one great purpose, we welcome here to-night Sir Charles McLeod, Chairman of the Royal Colonial Institute, and Lady McLeod.

I turn to Art, Letters, and Science. They always send their representatives to our gatherings, and have never sent us worthier than to-night. For we welcome no less personages than the President of the Royal Academy and the Director of the Victoria and Albert Museum. The former, bearing a name familiar to two generations of art lovers, is chief of the most assailed and most impregnable institution in London, that which artists spend half their lives in attacking, and the other half in defending as R.A.'s. We cannot entertain him in a *milieu* so interesting as his own festival hall at Burlington House; but we can assure him of a welcome at least as cordial as that which, with so much dignity and so much grace, he extended to his own guests about six weeks ago. Mr. Eric Maclagan has come lately to the supreme direction of that store-house of priceless things in South Kensington, and his reputation for connoisseurship and for museum-craft assures a new era in its history. We have no doubt that he will show us all the virtues and qualities of a really great museum director—among them those of ruthless acquisition and most obstinate retention.

In literature there are representatives here of very varied branches. If I am to take one name to represent all, may I choose that of Mr. Stephen Gaselee, publicist, and fine scholar, whose Anthology of Mediæval Latin has just scored a success? He holds what has always seemed to me the most desirable position in London, that of Librarian of the Foreign Office. I am but too little acquainted with the inside of that Library, but I picture it to myself, as Oxford seemed to Matthew Arnold, "So remote from the intellectual life of our century; so serene."

We welcome also various representatives of science; and indeed, we are all scientists here. I must take one as representing a great number, and there is no doubt whom I must choose, namely, that distinguished botanist, Dr. Seward, Master of Downing, and, as Vice-Chancellor, titular head of the greatest University in this country, which recognizes competence in geographical knowledge as all-sufficient for its higher Honours Degree. I regret that my own University is not among those giving such recognition; but there are others, notably the Victoria University of Manchester, which do so; and for that reason we offer cordial welcome to the distinguished President of the Geographical Society of that city.

As my eyes wander round the room I am reminded of various distinguished guests of whom I have not yet spoken. But the hour is late, and we are not Homeric heroes, minded to sit over flesh and wine into the dawn. Therefore I will mention but one other name, that of Dr. Wieder, Librarian of the ancient and glorious University of Leiden, a world-wide authority on mediæval maps, and our last-elected Corresponding Fellow. So much do we feel that he is now one of us, that your officers and Council are going to put into his bag, when he leaves this country, that unique map of which the President has spoken, the map of Hondius, to be exhibited in the City of Amsterdam. This loan has not lightly been agreed to by your Council. But in a great many ways, and particularly in matters of international amity, it is easy to overdo

"Safety First"; and your Council is assured that this sheet will be as safe in the City of Amsterdam as in the City of London.

I said at the outset that it would not be easy to propose briefly and adequately a toast to so distinguished and varied a body of guests. Briefly, I think, more or less, I have proposed it; adequately, I doubt! And I think it is going to be still more difficult for any one of that distinguished body to respond for the rest. I am bidden, however, to ask that the task be undertaken by an expert in the gentle and graceful art. You will be thanked, Fellows of the Royal Geographical Society, by the *doyen* of the Diplomatic Corps in London, thanked by one to whom, as a matter of fact, your own thanks are due in much greater measure for the unfailing urbanity with which he responds to public calls which become every year more frequent. When he speaks you will hear, if I mistake not, a master of our most unconscionable tongue. I have the honour to call upon you to drink the health of "Our Guests," and I am privileged to couple with that toast the name of the Spanish Ambassador, His Excellency Don Alfonso Merry del Val.

H.E. THE SPANISH AMBASSADOR: It cannot be denied that he who runs his eye down the toast list and finds his name set at the foot to respond to the health of "The Guests" has a great and substantial advantage because, on rising to speak, he may complain with some show of reason that, coming as he does at the end, his zone of operations has already been so much ploughed by those who spoke before him that it would take an even more remarkable person than Ruth of old to glean anything of account in the field which he has before him. He cannot help reflecting that his predecessors have said all the charming things with which he would have made such pretty play if he had only had the chance. He should, however, reflect that at such a stage of the proceedings a great share of toleration will certainly be accorded to him, because there are many who have already cast a furtive glance at their watch to see if they can still hope to return "home and so to bed" at their usual time, while others have become so influenced by the good cheer set before them—I speak quite hypothetically and with no special reference—that they are ready to take what comes without showing any of the fastidiousness they displayed earlier in the evening. Some there are, too, who wonder whether they still have time to go on and relieve Mamma at Lady Blank's dance in order to escort the young ladies home when the time comes, for I am assured that this highly respectable domestic custom still lingers on after the war, although I believe it would be more usual that the dear young creatures should wait until the "dear old bean" disappears before they retire to their maternal hearth, which I am afraid they designate now under a name savouring more of the trenches or of the public school, and but rarely to be found in the pages of the classics.

I feel confident in this respect, that I am both elated and even proud at being called upon to speak in the name of such a galaxy of intellect, of great achievement, of authority, of science as to make one amazed did he not remember that, after all, he is sitting at the table of the Royal Geographical Society. There is sitting by me my fellow-Ambassador, the representative of a great nation and a charming people, ever popular in this country and now endeared to you by bonds forged upon the battlefield. A nation and a people no less beloved in Spain than in England, for the very same reasons: not only for their charming selves but also because our soldiers have stood by theirs at many a hard-fought battle. There are at least two Governors-General present and many other distinguished guests for whom I am but a poor interpreter. I

thank you, however, members of the Royal Geographical Society, most heartily in their name, and most particularly do I thank Dr. Hogarth himself, of whom I did not know how to admire more, the mind or the heart, as I pondered upon his wonderful memory and the kind words in which he alluded to your guests this evening.

I feel I must pay a tribute of admiration to your President and most efficient Secretary for the fitness with which they have chosen a diplomat to speak to the Royal Geographical Society this evening, although their selection might have been happier and fallen upon a more worthy personage than myself. Two years ago it was remarked in the precincts of the Royal Geographical Society, not in this hall, that if diplomacy is to be considered the angel of peace, her wings should be, the one history and the other geography; for it is quite certain that a diplomat without any history or geography would be like a blind man endeavouring to dance the egg dance before a critical public. That is, however, not the only association of diplomacy and geography. Geography, as has been remarked this evening, is not only the science of the surface of the globe but also of those creatures who creep upon it and, since the advent of aeroplanes, those who fly in the air. In those categories you must comprise the whole of mankind. Your knowledge extends not only to the natural features of the world, but also to the races which inhabit it. The work of diplomacy is to make nations respect and like one another, so as to live in peace, and for this double end they must begin to know one another. That knowledge comes largely through geography when that geography is properly understood. There is, however, yet another aspect—and this applies to Geographical Societies in general, and very particularly to the Royal Geographical Society—and that is geography itself. It is by the intercourse of such societies that men of different nations are brought together. I could wish for no better example than the Geodetic and Geophysical Congress in which your delegates took part at Madrid last year. On that occasion you were able to see for yourselves the progress of Spain; you were also able to be witnesses of our organizing power, as was most kindly said to me by those who had been present. And lastly, I know that many of your members came under the charm of my Sovereign, King Alfonso XIII. I was told that they were able to recognize in him a gallant man, a man wholly devoted to the good of his country; a shepherd of his people and a leader of his nation; a man leading his flock ever forward along that straight wide highway which Longfellow describes so wonderfully in his word-picture "Castles in Spain."

Mr. President of the Royal Geographical Society, you have thought fit to offer to my Sovereign the honorary membership of your Society. My King has considered this as a great honour, and he has charged me to make to you the announcement that he accepts this honour with the greatest gratitude. It is but a few days since I received from His Majesty's Private Secretary a telegram saying that "His Majesty is much pleased to accept the appointment of Honorary Membership of the Royal Geographical Society of Great Britain, and he begs your Excellency to express his deep gratitude to the President of the Society." Ladies and gentlemen, I fear that I have perhaps dwelt a little too long upon matters chiefly interesting to myself, but I cannot sit down without once more expressing, with the greatest warmth and sincerity, the gratitude of all your guests at having been present at your table this evening.